YMPHATIC GLANDS

in Meat Producing Animals

D. ARTHUR HUGHES

LYMPHATIC GLANDS

IN MEAT-PRODUCING ANIMALS

THEIR METHODICAL EXAMINATION WITH SANITARY INSPECTION AS THE VIEWPOINT, TOPOGRAPHICAL DATA AND PATHOLOGICAL ALTERATIONS OCCURRING IN THESE ORGANS

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INSCRIPTION

To the Meat Inspection Service of the United States Department of Agriculture:

To the Veterinary Officials of that Service in Washington, whose exhaustive interpretation of the details of the Meat Inspection Law of June 30th, 1906, and strict administration of that statute have removed criticisms of American meats.

To the Veterinary Inspectors in charge at Meat Packing Centers, whose watchful attention to the application of the statute, as interpreted, has made the meat trade value its worth.

To the Veterinary Inspectors in the American abattoirs, whose work in Applied Pathology and in Manufactory Sanitation has won for them a high place in public esteem

THIS BOOK IS INSCRIBED

CONTENTS

PREFACE.

In the practical examination, immediately after slaughter, of cattle and swine for diseases, most of the work, in America and elsewhere, is likely to consist in the inspection for tuberculosis; because most of the condemnations of whole carcasses, or parts of carcasses, is due to the existence of that disease to such an extent as to warrant destruction of the meat under the direction of the veterinary inspector. In the United States the presence of well advanced cholera, shown in the post mortem inspection, has caused the condemnation of hogs in increasing numbers and the destruction of pork in total amounts second only to those for tuberculosis. The condemnations of sheep in the abattoirs of this country is largely for caseous lymph adenitis. The official statistics for 1913 in the United States are as follows:

Cattle	Whole carcases condemned for tuberculosis	Parts of carcases condemned for tuberculosis	
Total amount inspected 7,099, 080	33,001	47,554	
Hogs Total amount inspected 31,968,407	47,630	359,047	Whole carcases condemned for hog cholera 88,547
Sheep Total amount inspected 14,705,853			Whole carcases condemned for caseous lymph adenitis 2,340

It is a fact well known to every veterinarian with even the least experience in the post mortem examination of meat-producing animals, such as cattle, swine and sheep, that, of the inspection for the diseases mentioned—tuberculosis, hog cholera, and caseous lymph adenitis—the first, tuberculosis, calls for a close examination of the lymphatic glands of the carcass; the second, hog cholera, requires particular attention to the condition, not only of the skin, kidneys and intestines, but also to the changes in the lymphatics; in the third, caseous lymph adenitis, the attention of the inspector is confined almost entirely to the pathological changes in the lymph nodes.

Well known as all this is, for instance, to the thousand and sixty veterinarians in the Bureau of Animal Industry, which conducts the Meat Inspection under the United States Government, and well known as it is, besides, to English-speaking veterinarians everywhere, and all others, who have to do with post mortem examination of meat-producing animals, there has never yet appeared in English a book devoted completely to the methodical examination of the lymphatics. It is the aim of the translators to fill the gap in our English and American veterinary literature. For, the man who begins post mortem work in the examination of the carcasses of meat-producing animals for disease, whatever be his preparation in pathology and para-

sitology, will find himself not so useful as he should be, at least for a time, without he has a knowledge of the topographic normal anatomy of the lymphatic system and of the morbid anatomy of the lymphatic glands. Experience shows that the puzzling thing to a novice is not so much to decide promptly on abnormalities, but to locate readily the glands—the problem is that of the acquisition of an exact knowledge of the anatomy of the lymphatic system. A book, therefore, upon this long-omitted subject, should serve a useful purpose.

With the cordial consent of the author, Monsieur P. Godbille, Section Chief of the Veterinary Sanitary Service of Paris, France, and the Department of the Seine, and with the hearty acquiescence of Dr. H. Martel, editor of *L'Hygiene de la Viandes et du Lait,* in whose journal it appeared in the years 1909 and 1910, and with the approval of M. R. Michault, the publisher, we have translated and put into readable English Godbille's book, *Examen Methodique des Ganglions Lymphatiques des Animaux des Boucheries de point de vue l'inspection des viandes,* and present to English-speaking veterinarians of the world this concisely written book on the lymphatic glands. Part One of the book treats of the topographic anatomy of lymphatic glands. Part Two takes up the histological features of the normal glands, the changes that occur in them in bacterial diseases, and the pathological pictures they present

in the various diseased states. Hence the book, though short, is complete, and should prove of service to any person with sufficient training in the medical sciences who intends to enter upon the work of examining for disease the carcasses of meat-producing animals.

We join with our French colleagues, who first published this work in Paris, in the same feelings of cordiality and goodwill with which they give their consent to its translation into English and publication in America. To our American publishers we extend the hand of thanks for their ceaseless endeavors to bring the work through the press in accordance with their high standards. And we bid the book to go forth on its mission of helpfulness wherever that is desired.

INTRODUCTION

The Necessity for Knowledge of the Topographic Anatomical Data and of the Pathologic Alterations in these Organs.

The inspection of the lymphatic glands of animals likely to be tuberculous is of capital importance from the point of view of the sanitary inspection of meat. Every time that lesions of such nature are found in the viscera or the serous membranes of the splanchnic cavities of this class of animals, either in greater or lesser degree, it is absolutely necessary to search for the alterations that tuberculosis leaves in the tissues of all other regions besides these cavities. The orders of the Secretary of Agriculture regulating conditions for the condemnation of the meat of tuberculous animals, indeed, directs the complete confiscation of such animals when lesions are detected in the intra-muscular glands of the various regions.* The result is also the same when

*The "Secretary of Agriculture" referred to here is the French national officer. For regulations on the Meat Inspection of the United States Department of Agriculture, see Bureau of Animal Industry order number 211, effective, in part, November 1, 1914, and, in part, January 1, 1915, and subsequent order as they appear. Especially, in order 211, note pp. 22-34.

coexisting serious lesions are localized in one of the two visceral cavities or extend over a limited surface of the two pleural and peritoneal serous membranes.

Quite often it is also necessary to resort to incision of the lymphatic glands, when meats, prepared without sanitary control in private slaughtering places, are presented, without viscera, to be distributed in small quantity, or are intended for school, hospital, or penitentiary establishments. All these meats, well prepared, and free from ecchymotic, inflammatory or any other lesions, which cause them to deteriorate in places, may, notwithstanding all the preparatory care they have received, present indications of abnormality which call for the attention of those familiar with the work of the examination of meat.

The tearing off, for instance, of the serous membrane, which attracts the attention because of the stringy appearance left by the laceration of the tendinous, aponeurotic or periostic fibrillae of the parts underneath, must always be a cause for further inquiry by those who are given charge of the work of watching for the sanitariness or insanitariness of the goods delivered. It is well known also that sometimes this is done only to remove the stains that blood has left on the pleura when the slashing of the blood-vessels entering the chest has been too deep, or when one of the anterior pleural *cul de sacs*

has been punctured, when the animal was being bled. It then becomes evident how advantageous the examination of the lymphatic glands may be when growths on the pleura have been removed.

Again, the nature of some visceral lesions or of the exact anatomy of some tissues of which the meat is composed, must very often also be established. It is thus that one may be called upon to differentiate tuberculosis from the bony or muscular neoplastic lesions; from the neo-membranous products such as those more or less fringy or spreaded, having a russet color and found adherent to the surface of the serous membranes of lean cattle; from the pleuretic adhesions with piriform and pedunculated purulent centers found on the pleura of swine; from the little islets of chronic broncho-pneumonia with parasitic or microbian origin; from the parasitic regressing cysts with more or less caseous degeneration of their contents; from the sarcomatous lesions, and from abscesses of the liver or the spots of necrosing hepatitis, etc., etc.

It is by examining the glands corresponding to the lymphatic area of the diseased parts that at once and with certainty the real tuberculous nature of the lesions found can be confirmed.

As the lymphatic glands are usually enveloped by fat or are isolated between muscular layers, the object of this book, written concisely, is to indicate how these organs can be most readily found be-

cause of their precise topographic relationships and by the anatomical data which at once tell of their presence.

In general, the glands are situated in the neighborhood of arteries and veins, the lymphatic vessels being their satellites. Their size is not always in proportion to the caliber of the blood-vessels round which they are situated. Quite often, the smallest glands are found in the apex of the bifurcation of the large trunk of the circulatory apparatus or again along the course of some of them (carotid, sub-lumbar portions of the aorta).

In order to expose in a rational manner the anatomical location of the glands, the best method is to study their relations with the blood vessels and the parts of the skeleton belonging to the regions with which they are connected. Accordingly we shall examine them as follows:

1. Thorax, anterior leg, neck, and head.
2. Abdomen, pelvis, posterior leg.
3. Thoracic and abdominal viscera.

PART I

TOPOGRAPHIC ANATOMY OF THE LYMPHATIC GLANDS IN FOOD-PRODUCING ANIMALS

SECTION I

SITUATION AND CHARACTERISTICS OF THESE GLANDS IN THE BOVINE SPECIES

PART I

Topographic Anatomy of the Lymphatic Glands in Food-Producing Animals

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SECTION I

Situation and Characteristics of these Glands in the Bovine Species.

CHAPTER I

Bovine Species.—Thoracic Lymph Glands and Glands of the Anterior Leg.

Chest Entrance. All the glands of this region have been collected in a single group, under the general name of the *prepectoral.* On the inner face of each scalent muscle, or that of the superior part of the first rib, there is a gland, which is in relation on the right side with the trachea, to which it is often adherent; while on the left side, the symmetrical organ lays against the œsophagus. These glands, not mentioned in the various publications on anatomy, are called the *internal prepectorals.* Below the part where the trachea and œsophagus are

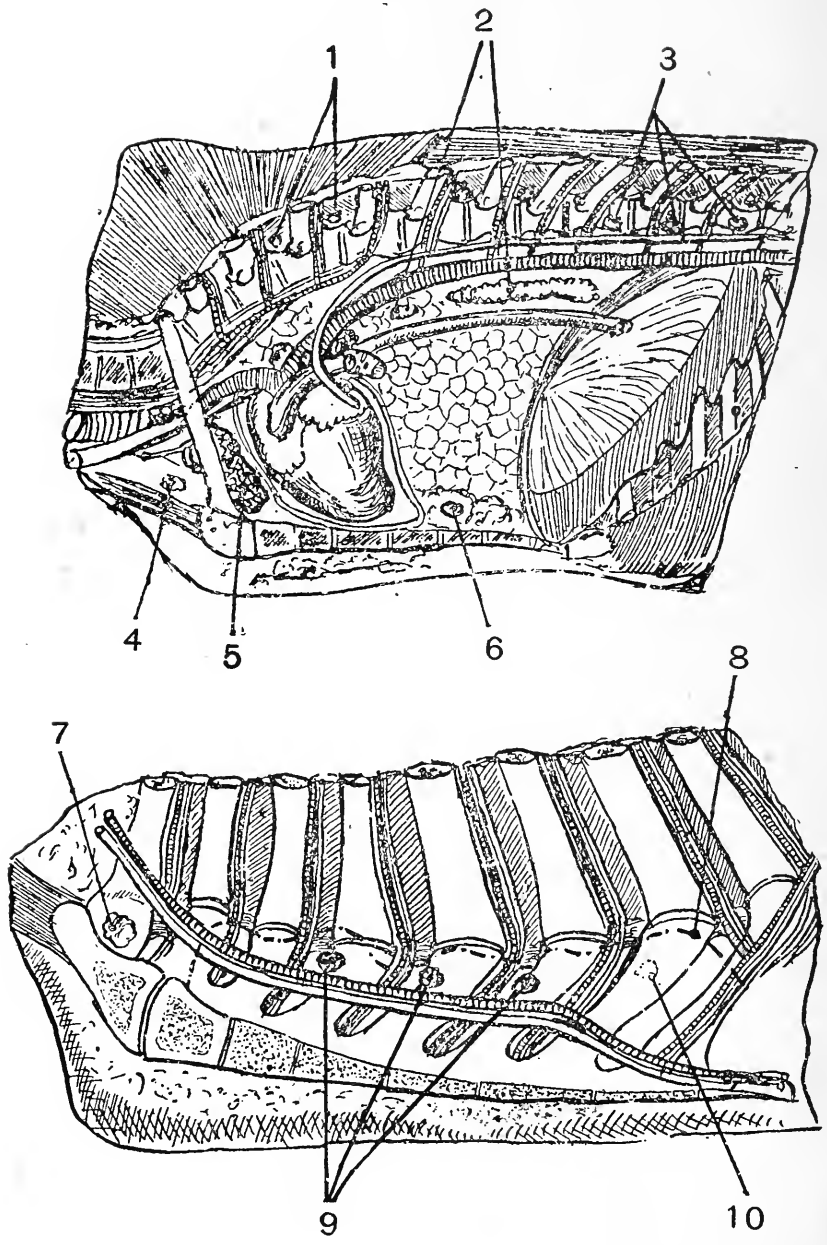
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Fig. 1.

Parietal and Visceral Lymphatic Glands of the Thoracic Cavity.

1. Intercostal Lymphatic Gland.
2. Œsophageal or Posterior Mediastinal Lymphatic Glands.
3. Dorso-Aortic Lymphatic Gland.
4. Axillary Lymphatic Gland.
5. Thymus.
6. Sterno-Diaphragmatic Lymphatic Gland.
7. Presusternal Lymphatic Gland or Gland of Van Hersten.
8. Insertion of the Triangularis Sterni Muscle.
9. Sus-Sternal Lymphatic Glands.
10. Sub-Pleural Lymphatic Gland of the sixth rib.

placed alongside each other, and above the angle of the separating carotids, there is a median glandular mass, the *prepecto-tracheal.*

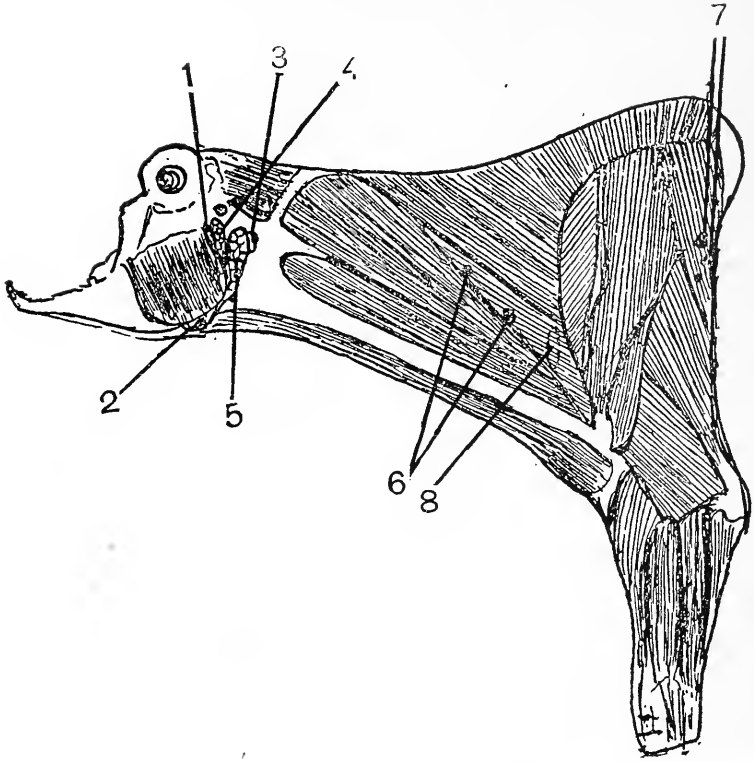
The *external prepectoral* glands consist of: First, one or two glands, rather large and situated down the jugular groove, on the level of the junction of the axillary vein and the inter-axillary space (tracheo-cephalic trunk) with the jugular. These glands, easy to explore on living, lean animals, have been improperly designated as *axillary;* the name of *pre-axillary* would be more appropriate on account of their situation with regard to the axillary region. There are to be found, secondly, one or two more or less voluminous glands lying against the external face of the first rib, downward from the axillary artery and vein. These external glands correspond to the sub-clavicular of man and not to the axillary.

Dorsal Region. In the vertebro-costal groove, between the longus colli muscle and two or three of the first ribs, there are, on the course of the vertebro-dorsal artery, two or three glands called the *anterior intercostal.* Above the posterior aorta and on each side of the bodies of the vertebrae, and surrounded by fat, there are a series of small glands as large as peas, which are sometimes visible under the costal pleura. They are generally situated close to each intercostal artery in the hollow places made between the vertebro-costal articulations. These are also often found lying lower down on the ver-

tebral bodies, and are called *dorso-aortic,* or *posterior intercostal,* according to their situation. In some cases they are divided into a *dorso-aortic* and an *inter-costal.* The glands situated opposite the eleventh and twelfth intercostal spaces are generally very large.

Sternal Region. Above the sternum and along the internal thoracic vein and artery, there is to be found opposite each intercostal space a lymph gland varying in size from the head of a pin to a large pea. From the sternal cartilage of the second rib, both blood vessels and glands are entirely covered by the triangularis sterni muscle. To expose them, it is necessary to cut through the muscle from forward backward, the edge of the instrument following a line situated about two centimeters below the chondro-costal enlargements. This division of the muscle uncovers the blood-vessels, and, as the glands are generally situated in the posterior angle which is formed (when the internal thoracic blood-vessels give off the intercostals), a small incision made perpendicularly and near the posterior border of the rib, will be sufficient to expose the glands. When the fat which surrounds the blood-vessels and the glands is removed, these will be found above the thoracic artery and below the border of the ligament, which unites the superior extremities of the costal cartilages.

The lymph glands called the *sus-sternal* are of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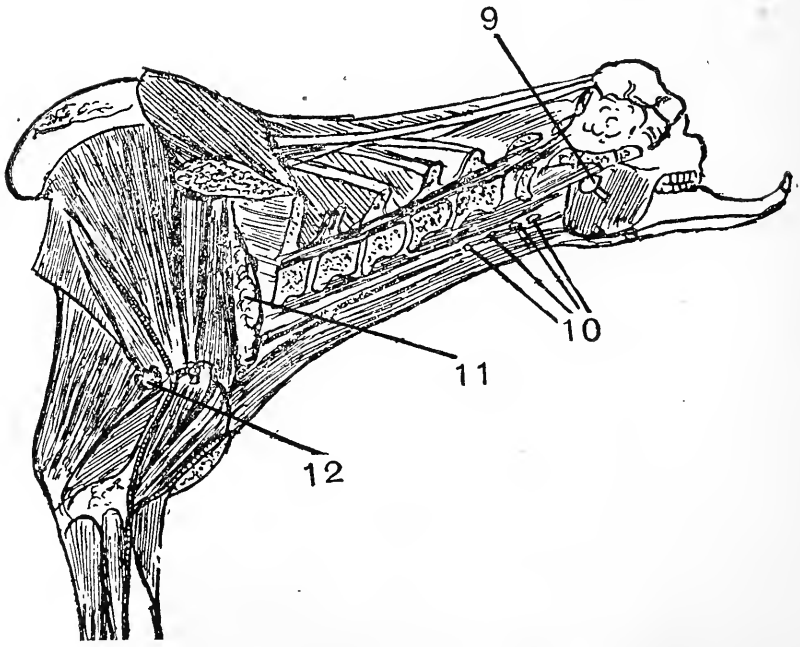
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Fig. 2.

Superficial Lymphatic Glands of the Neck and Shoulder.

1. Parotid Lymphatic Gland.
2. Maxillary Lymphatic Gland.
3. Sub-Atloid Lymphatic Gland.
4. Parotid Salivary Gland.
5. Maxillary Salivary Gland.
6. Sub-Cutaneous Hematic Gland.
7. Sub-Cutaneous Hematic Gland.
8. Level of Pre-Scapular Lymphatic Gland.
9. Retro-Pharyngeal Lymphatic Gland.
10. Middle Cervical Lymphatic Gland.
11. Fat round Pre-Scapular Gland.
12. Brachial or Sub-Scapular Gland.

various sizes. There may be one, two, or three large ones; while the others diminish gradually, to be reduced to fine hematic granulations or may even disappear entirely. Those most frequently found are situated below the third, fourth and fifth intercostal spaces.

In the hollow place formed by the cartilage of the first rib and the lateral face of the first sternebra, there is always found a gland about the size of an almond, which is called the *presusternal.* A Belgian veterinarian, Van Hersten, was the first to call attention to it in the examination of meats which were suspected of being infected with tuberculosis.

On a level with the costo-chondral articulation of the sixth rib, under the pleura and surrounded by a streak of fat, there is very often found a small unnamed lymph gland, which corresponds to the sterno-diaphragmatic gland of man.

Finally, mention must be made of a thoracic gland named the *sterno-pericardiac,* situated back of the point of the pericardium, between the folds of a piece of the mediastinum which remains adherent to the sternum and to the diaphragm, and concealed in a floating layer of fat. It is homologous to the median diaphragmatic gland of man.

Attached to the anterior face of the diaphragm, there may be found a long, large gland, which, in its natural position, is situated between the layers of

the posterior mediastinum, and which separates the posterior aorta from the œsophagus. We shall again speak of this gland (œsophago-aortic) when considering the visceral glands.

Lymph Glands of the Anterior Leg. When the fore extremity has been severed from the chest, these glands that we have mentioned as external prepectorals and which are on the external face of the first rib, may often be seen adhering to its inner face. Posterior to the humeral artery and vein and against the tendon common to the great dorsal and the adductor muscles of the arm, there is an oval flattened gland, named the *sub-scapular* or *tracheal,* which is homologous to the axillary group of man.

We have never been able to find the gland in cattle situated on the internal face of the elbow, which is called the *sus-epitrochlear* in the horse and man.

In front of the anterior border of the shoulder and a little above the scapulo-humeral joint, there is an enormous, elongated gland, named the *pre-scapular,* which corresponds to the sus-clavicular of man. It is situated under the small triangular band formed by the visible part of the scapular portion of the mastoido-humeralis muscle (omo-trochelian), and it is entirely surrounded with fat. This gland, named the *inferior cervical* by veterinary anatomists, is situated on the course of the inferior cervical vein and artery (ascending branches) which run upward along the anterior border of the shoul-

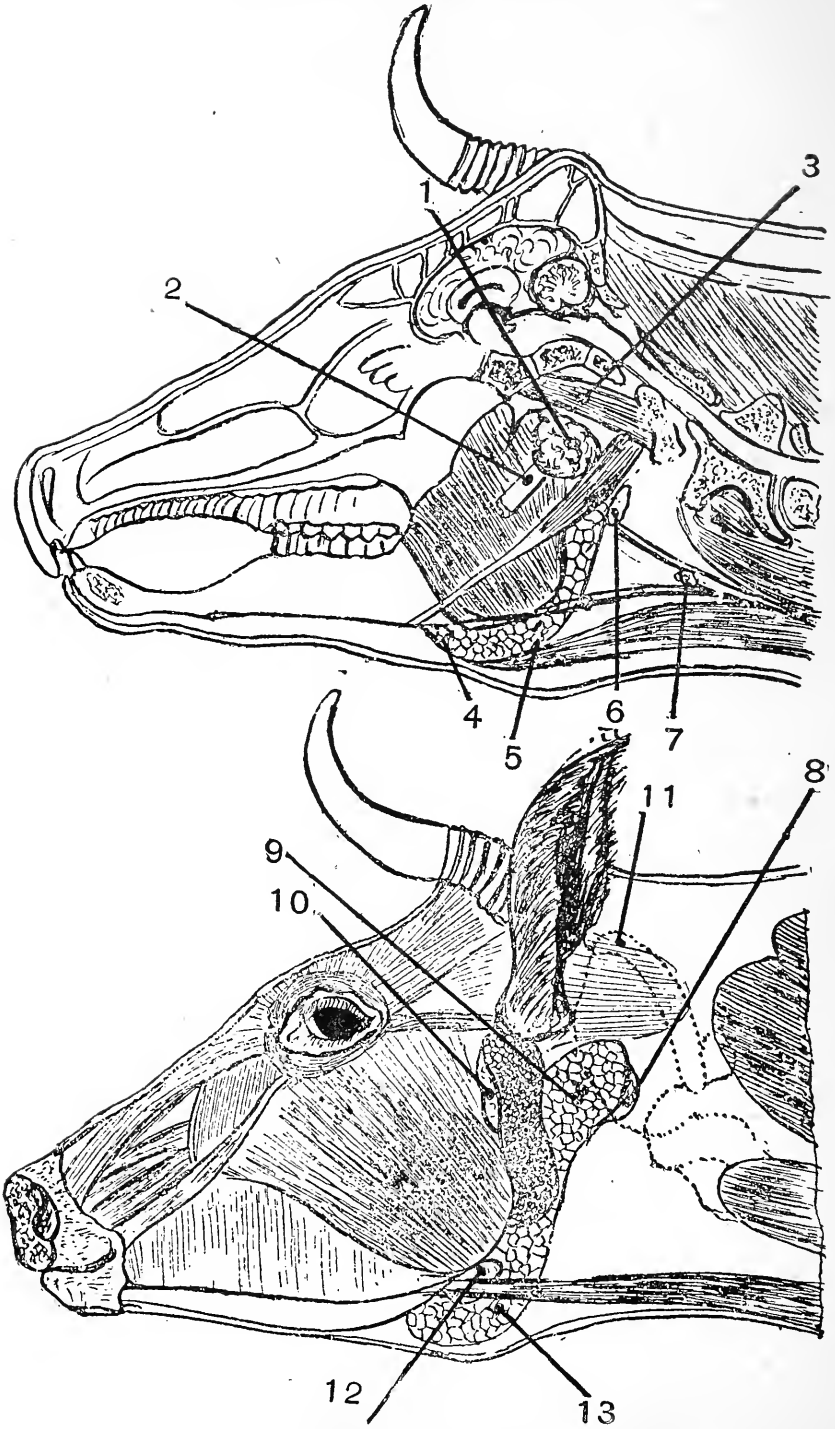
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Fig. 3.

Superficial and Deep Lymphatic Glands of the Head and Guttural Region.

1. Retro-Pharyngeal Gland.
2. Hyoid Bone.
3. Great Anterior Straight Muscle of the Head.
4. Maxillary Lymphatic Gland.
5. Maxillary Salivary Gland.
6. Atloid Gland.
7. Jugular Lymphatic Gland.
8. Atloid Lymphatic Gland.
9. Parotid Salivary Gland.
10. Parotid Lymphatic Gland.
11. Wing of the Atlas.
12. Maxillary Lymphatic Gland.
13. Maxillary Salivary Gland.

der and are marked by four or five little hematic glands.

Two or three superficial lenticular, hemolymphatic glands, situated four, five or six centimeters down from the dorsal angle of the scapula, may also be found on the external face of the adductor muscle and the superior extremity of the long extensor muscle of the forearm. In animals in good condition, they are entirely surrounded by fat.

CHAPTER II

Bovine Species.—Glands of Neck and Head.

If, when taking off the fore leg from the chest, the incision into the superficial muscles of the neck has been made close to the anterior border of the shoulder, the prescapular glands and the chain of hematic glands are found adherent to the base of the neck, surrounded with fat. On the surface of the sub-cutaneous triangular portion of the omo-trachelian muscle, from two to five hemo-lymphatic glands are sometimes found on the inner face of the jugular and along the carotid artery; if this has been left by the butcher when he removed the trachea, one may meet with small scattered glands which are so minute as to be almost indistinct. These are the *middle cervical,* which are on a level with the bifurcation of the jugular vein, namely at the larynx. One of these glands becomes larger than the rest.

On the superior part of the neck, under the wing of the atlas, and on the course of the occipital veins and arteries, the *sub-atloid* gland is located. As

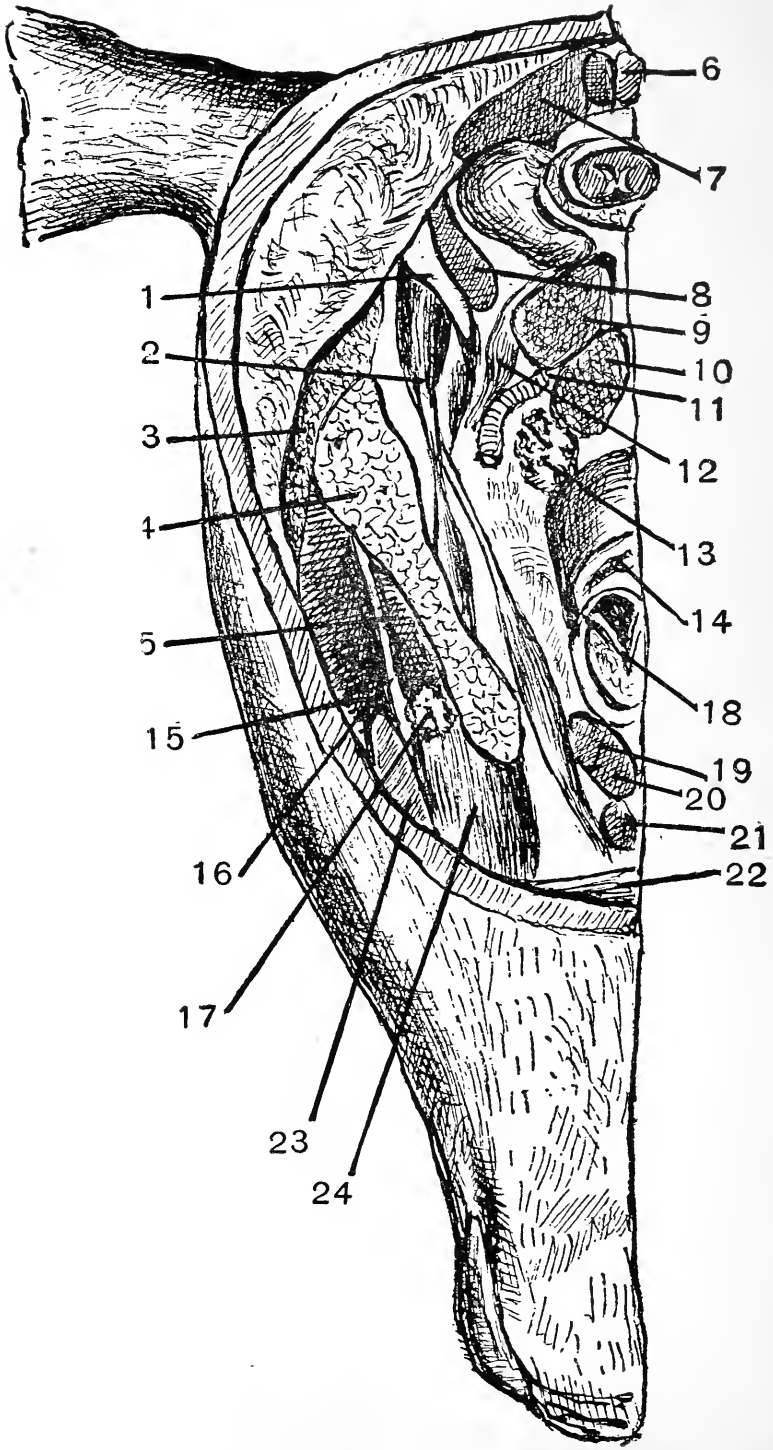
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Fig. 4.

Topography of the Lymphatic Glands of the Head.

1. Styloid Process.
2. Hyoid Bone.
3. Parotid Salivary Gland.
4. Maxillary Salivary Gland.
5. Internal Pterygoid Muscle.
6. Cervical Ligament.
7. Complexus and Posterior Straight Muscle of the Head.
8. Lateral Small Straight Muscle.
9. Anterior Ditto (Small).
10. Anterior Ditto (Great).
11. Carotid Artery.
12. Superior Cervical Nervo-Ganglion.
13. Retro-Pharyngeal Lymphatic Glands.
14. Œsophagus.
15. Masseter Muscle.
16. Border of the Inferior of the Maxillary Bone.
17. Maxillary Lymphatic Gland.
18. Larynx.
19. Stylo-Hyoideus Muscle.
20. Omo-Hyoideus Muscle.
21. Sterno-Hyoideus Muscle.
22. Mylo-Hyoideus Muscle.
23. Sterno Maxillaris Muscle.
24. Digastricus Muscle.

large as an almond, it lies against the small anterior straight muscle of the head and is completely covered by the maxillary salivary gland.

The head presents on each side three lymphatic glands which should be examined. The first is the *parotid,* a flat little mass, situated immediately under the salivary parotid gland, and against the posterior face of the condyle and synovial capsule of the temporo-maxillary articulation. Its superior extremity is located in the bottom of the temporal fossa, while the inferior is spread on the external masseter muscle, extending a little over the anterior margin of the parotid salivary gland. The two organs are easily differentiated by their coloration, the salivary gland being of a brilliant red color. The second is the *maxillary* or *sub-glossal* gland, situated inside the border of the inferior maxillary bone, back of the masseteric groove, where the facial vein and artery are lodged. It is covered by the tendon of the sterno-maxillaris muscle and lies in the slight lateral depression of the inferior extremity of the maxillary salivary gland, and it is surrounded by fat. The third is the *retro-pharyngeal* gland, lying within the superior part of the ascending branch of the hyoid bone under the great anterior straight muscle of the head, which is also named the *sub-sphenoidal,* or *hyoid* gland. There is also a second pharyngeal gland, smaller in size, situated in front of the larger pharyngeal, just mentioned.

The *hyoid* lymph gland cannot be mistaken, on account of its size, for the plexiform, nervous ganglion of the pneumo-gastric nerve, which is found a little back of it, imbedded between the superior extremity of the branch of the hyoid bone and the great anterior straight muscle, and in front of the foramen lacerum of the temporal bone. This fusiform organ is well developed in cattle.

If, instead of having the head split in two parts, at the same time as the neck is split, as, for instance, is done in Paris, the head is cut off from the neck before it is separated in halves, the position of the glands differs somewhat. In this case, to expose the retro-pharyngeal glands, all that is necessary will be to incise the fat and connective tissue, which is between the great and small anterior straight muscles of the head, which are seen under the occipital condyles and the superior extremity of the branch of the hyoid bone. The stump end of the carotid and the divided œsophagus are below the point where the gland is to be found. When the butcher removes the tongue, the maxillary and retro-pharyngeal lymphatic glands may remain attached to the organ. On the removed tongue, the retro-pharyngeal glands are then found adherent to the branches of the hyoid bone, while the maxillary glands are enveloped in the fat that lies under the tongue.

One must be careful not to mistake for the gland

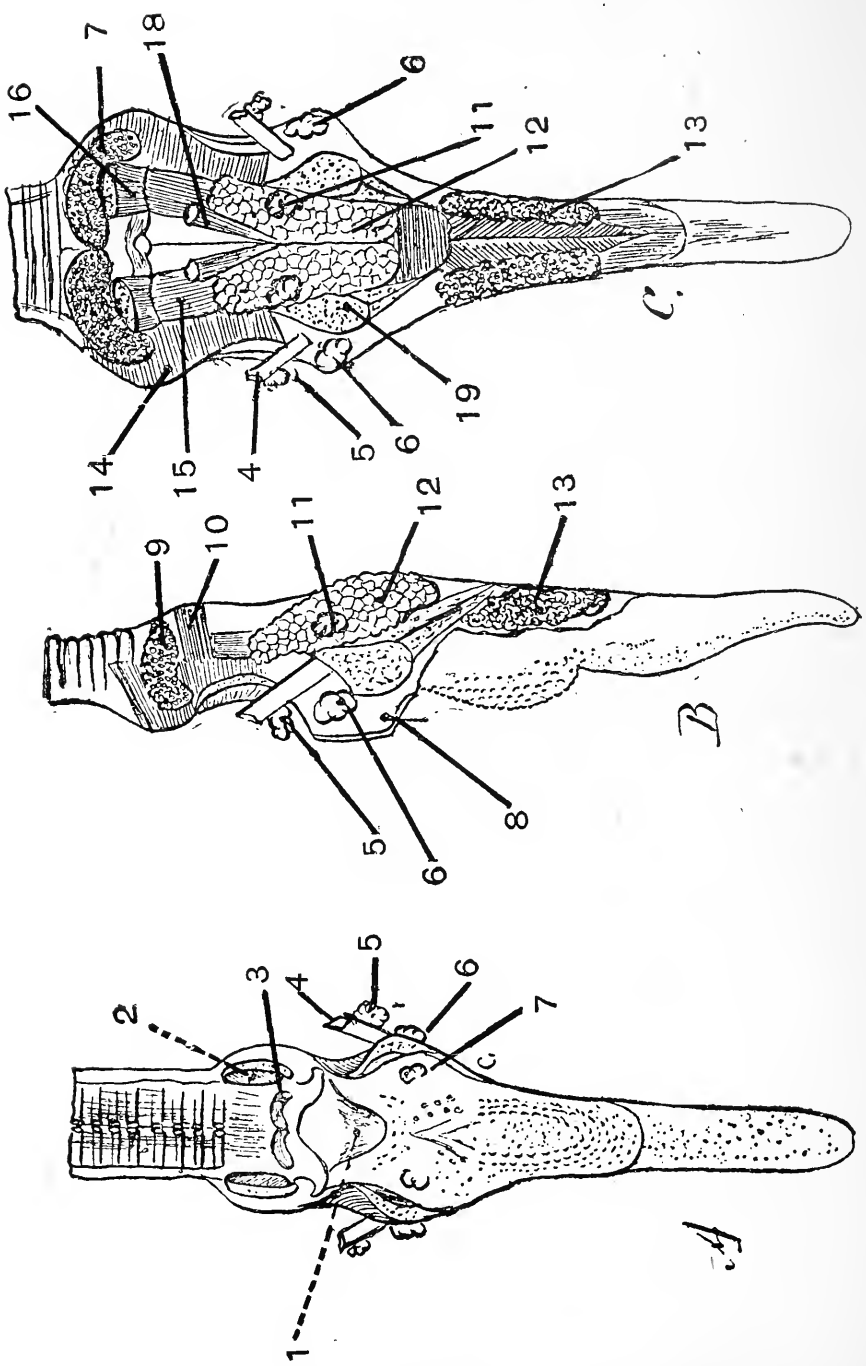
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Fig. 5.

Lymphatic Glands of the Tongue of Cattle.

A.—Superior Face. B.—Lateral. C.—Inferior.

1. Epiglottis.
2. Cricoid Cartilage.
3. Arytenoid Cartilage.
4. Hyoid Bone.
5. Retro-Pharyngeal Lymphatic Gland.
6. Amygdale.
7. Foramen Cœcum of Mortgagny.
8. Soft Palate.
9. Thyroid Cartilage.
10. Crico-Thyroideus Muscle.
11. Maxillary Lymphatic Gland.
12. Maxillary Salivary Gland.
13. Sub-Lingual Salivary Gland.
14. Thyro-Pharyngeus Muscle.
15. Hyo-Thyroideus Muscle.
16. Sterno-Hyoideus Muscle.
17. Thyroid Body.
18. Sterno-Hyoideus Muscle.
19. Pterygo-Pharyngeus Muscle.

the tonsil, which is at the base of the tongue, and which is recognized by the fact that its bottom is covered with lymphoid crests and is open near the lateral insertion of the velum palati, opposite the apex of the epiglottis. On section, the tonsil, which may also be diseased and hypertrophied by tuberculous lesions, shows, among the lymphoid follicles, small yellowish, muciparous granules, which cannot be mistaken for lesions.

CHAPTER III

Lymph Glands of the Abdominal Wall, Pelvic Cavity and Hind Extremity

To exactly locate the anatomical situation of the lymph glands of these regions, one must be well acquainted with the relations of the aortic trunk and have knowledge of its ramifications.

Sub-Lumbar Region. In front of the hilus of each kidney and at the junction of the renal veins and arteries with the aortic trunk and the vena cava, the *renal* gland is found. It is of the size of a hazel nut, and must not be confused with the supra-renal capsules. These, however, are the larger and are situated near the anterior part of the kidney, and on section show a thin cortical layer of a light brown color and of a uniform thickness, readily distinguished from the medullary layer which is of a rosy, yellowish color.

The right *renal* lymph gland is almost always concealed by the renal vein which covers it.

On each side of the sub-lumbar portion of the posterior aorta, there are a series of small lymph or

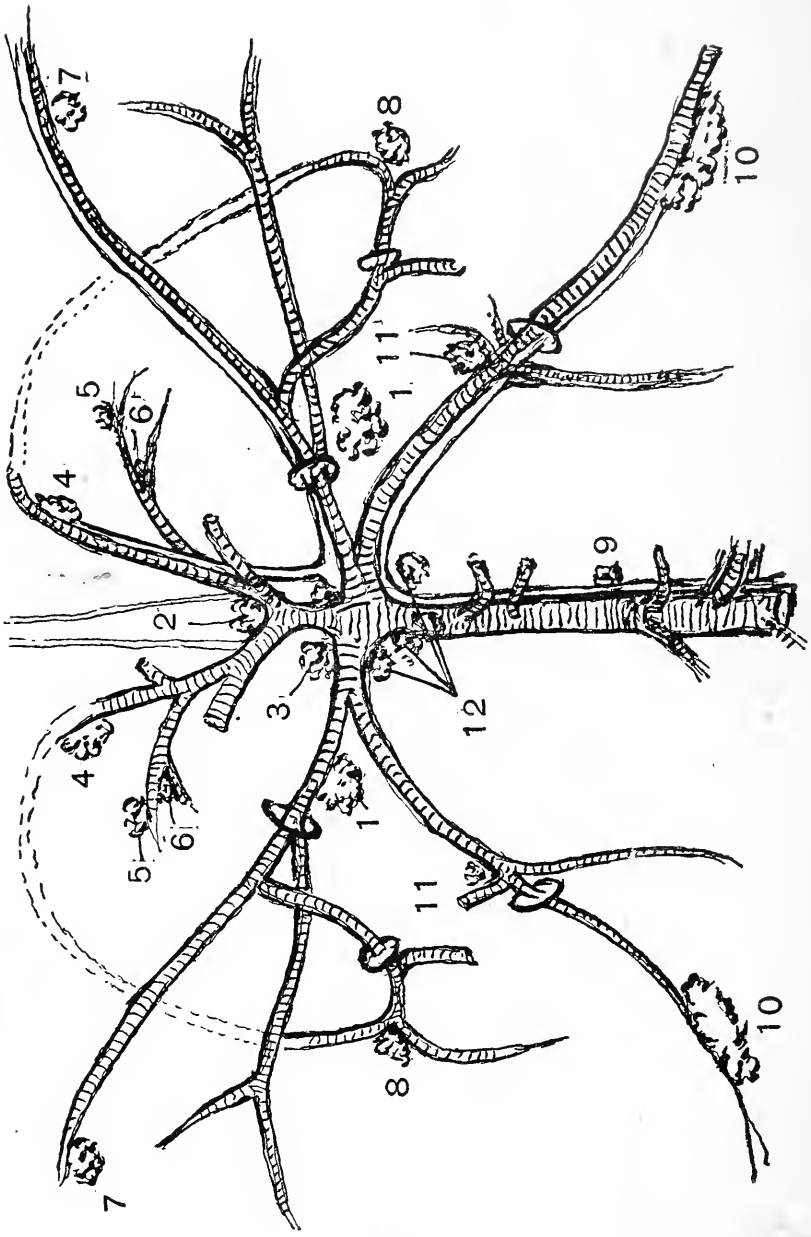
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Fig. 6.

Relations of Lymphatic Glands of the Hind Quarter to the Blood Vessels.

1. External Iliac Lymphatic Gland.
2. Middle Iliac Lymphatic Gland.
3. Internal Iliac Lymphatic Gland.
4. Ischiatic Lymphatic Gland.
5. Gluteal Lymphatic Gland.
6. Sacro-Iliac Lymphatic Gland.
7. Popliteal Lymphatic Gland.
8. Inguinal Lymphatic Gland.
9. Renal Lymphatic Gland.
10. Pre-Crural Lymphatic Gland.
11. Circumflex Iliac Lymphatic Gland.
12. Sub-Lumbar Lymphatic Gland.

hematic glands (lumbo-aortic chain), irregularly distributed in the fat that covers the vascular trunks. In front of the terminal quadrifurcation of the posterior aorta and of the posterior vena cava, there are two or three glands (sub-lumbar), which are much larger and which are found lying upon the blood-vessels.

Pelvic Region. In the angle formed by the external and internal iliac arteries there is a small gland, the *internal iliac;* and in the angle formed by the two internal iliacs and on the median line there is another of the same size but single, which is called the *median iliac* or *sub-sacral* gland.

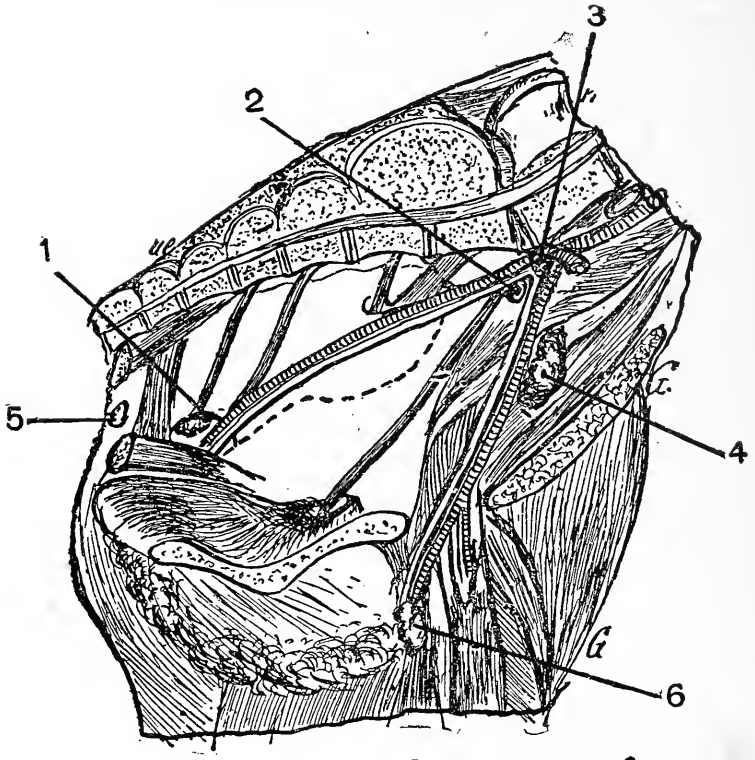
The internal iliac artery, continued by the ischiatic, is often provided with a small lymph gland, concealed in fat, and on a level with the point of origin of the internal pudic artery. Coming out of the pelvic cavity, through the small sciatic notch, the ischiatic artery and vein are in connection with a lymph gland, the *ischiatic,* which is quite large. To expose it, one must follow the internal iliac and ischiatic arteries and raise the ischio-renal muscle which covers the small ischiatic notch. The gland, enveloped with fat, is on the border of the notch. On each side of the vertebral body of the sacrum, there may be found, enveloped with pelvic fat, one or two small glands, often hematic, known as the *lateral sacral.* On the external face of the sacro-sciatic ligament opposite the transverse process of

the third sacral vertebra and against the posterior border of the middle gluteus muscle, there is a gland the size of an almond, which has not yet been described, and near which the gluteal artery and vein arrive. This gland, however, which will be called the *gluteal,* is not always present. Another little gland is also frequently found in front of it. It is situated back of the sacro-iliac articulation, and hence the name of *sacro-iliac* is given to it.

From the internal pudic artery and vein vascular branches run backward to meet a lymph gland situated in the fat at the base of the tail, and which is named the *anal* gland.

Crural Region. On the sides of the border of the anterior straight muscle of the pelvis, on the surface of the great psoas muscle and in the angle formed by the external iliac and the circumflex iliac arteries, there is a large gland, the *pre-iliac* or *external iliac,* which is easily exposed by cutting, flatwise, the prepelvic mass of fat which is thickest at that point.

Below the angle of the haunch, the circumflex iliac artery subdivides into two branches, and, on a level with this bifurcation, there is found the *iliac circumflex* gland, although it is not always present. It is about the size of a hazel nut. The posterior or pre-crural branch of the circumflex artery comes out of the abdominal cavity by a kind of arch, sloping slightly over the superior bor-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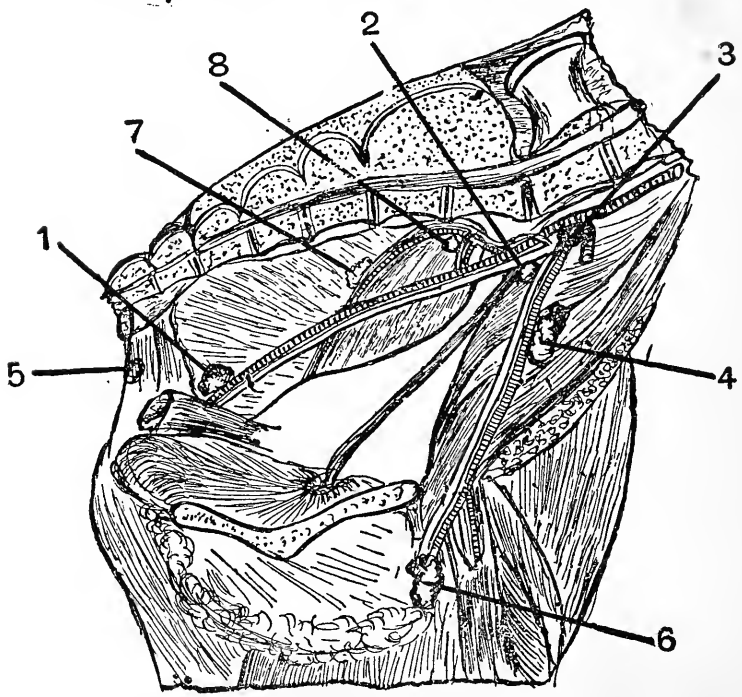
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Fig. 7.

Lymphatic Glands of the Pelvic Cavity.

1. Ischiatic Lymphatic Gland.
2. Internal Iliac Lymphatic Gland.
3. Middle Iliac Lymphatic Gland.
4. External Iliac Lymphatic Gland.
5. Anal Lymphatic Gland.
6. Superficial Inguinal Lymphatic Gland.
7. Gluteal Lymphatic Gland.
8. Sacro-Iliac Lymphatic Gland.

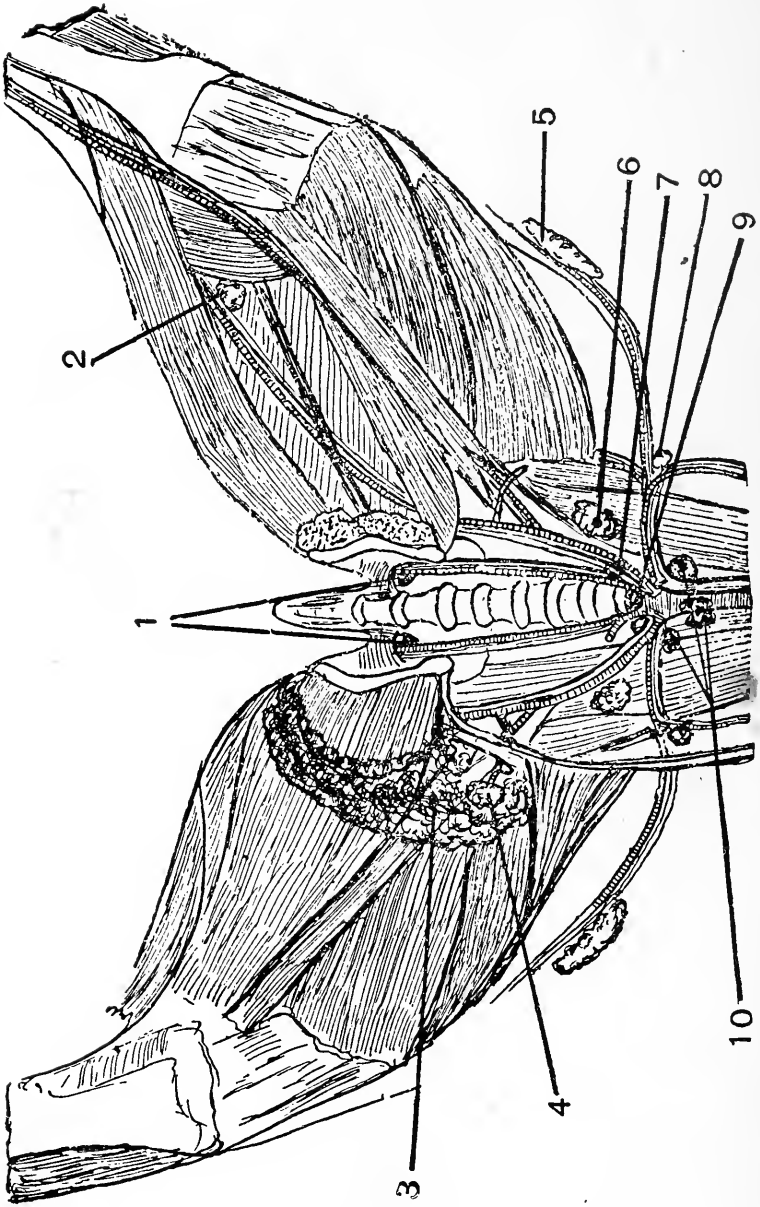
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Fig. 8.

Lymphatic Glands of Hind Quarter of Cattle.

1. Ischiatic.
2. Popliteal.
3. Inguino-Perineal.
4. Inguinal.
5. Pre-Crural.
6. External Iliac.
7. Internal Iliac.
8. Circumflex Iliac.
9. Middle Iliac.
10. Sub-Lumbar.

der of the aponeurosis of the great oblique muscle of the abdomen, and then lies on the internal face of the ilio-aponeurotic muscle, whence it reaches the hilus of an enormous elongated lymph gland, called the *precrural.* This gland is situated back of the hollow portion of the flank between the anterior border of the fleshy portion of the fascia lata and the posterior border of the panniculus carnosus. It is enveloped with the fat of the stifle region. There is no pre-crural glandular chain.

On the external face and near the anterior border of the muscle tensor vaginae, there are often two or three small glands, which are hemo-lymphatic in nature. Four other similar glands are situated in the hollow portion of the flank, two fingers across from the posterior border of the last rib and on the surface of the great oblique muscle of the abdomen, to which they intimately adhere. Those four glands are of various sizes and are four or five centimeters apart, forming a sort of square. In animals in good condition, they are surrounded by the fat of the flank. Exceptionally, one of these glands may be adherent to the last rib. Quite often all four are hematic.

Under the aponeurosis of the great oblique muscle of the abdomen, on a line with the crural arch and between the two terminal branches of the adductor of the thigh, there is sometimes found, along the femoral artery, a large gland, called the *deep*

inguinal. If, on the posterior wall of the inguinal canal, one follows the external pudic artery, there will be found near its division into the sub-cutaneous artery of the abdomen and the mammary artery or the dorsal artery of the penis, a pair of glands, which are specially large in cows rich in milk. These are the *superficial inguinal* of males, the *retro-mammary* of females. Taking into consideration a half carcass, we may say that this organ is situated in the fat of the perineum, and, in a split carcass, it can be discovered by cutting away the fat and by following a line, the continuation of that which limits in front the anterior border of the muscular sub-pubic symphysis. In animals castrated by sub-cutaneous double torsion, this cut exposes sometimes the atrophied testicles, which present a uniform saffron yellow color and which are surrounded near the capsula by a reddish vascular border.

If, after removing the muscles of the internal crural region, including the semi-membranosus, the great deep muscular artery is traced as it twists within the coxo-femoral articulation, one will meet, at the apex of the angle formed by the posterior line of the gemini of the leg and the anterior border of the semi-tendinosus, a fatty mass which surrounds a rather large gland, the *popliteal,* which is easily exposed by cutting away the fat that lies between the two muscles.

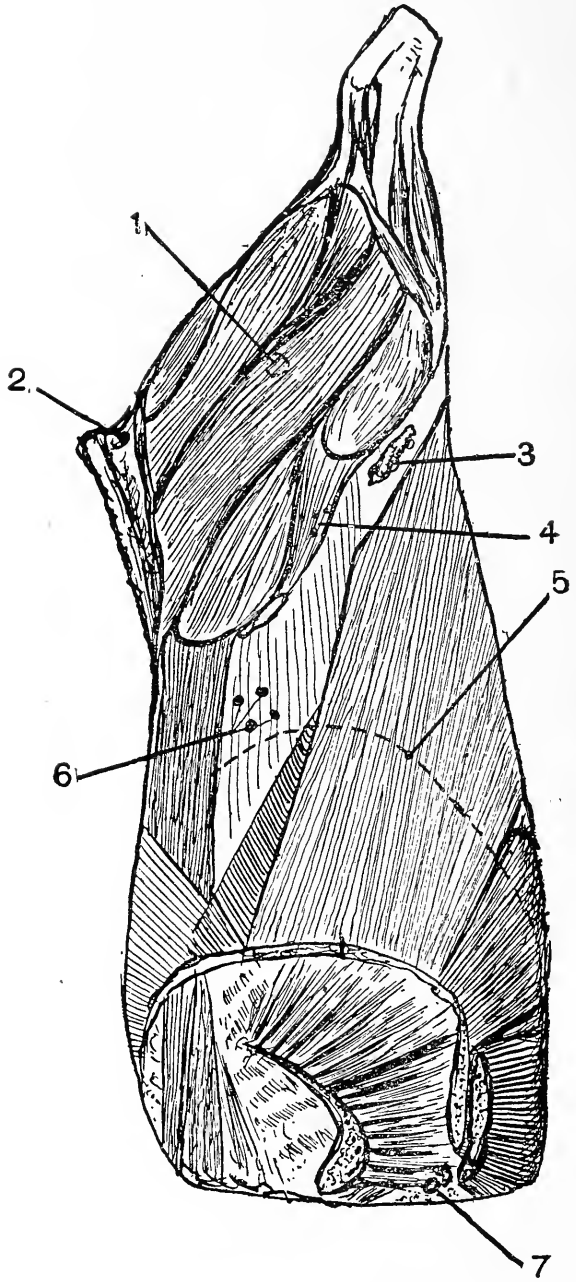
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Fig. 9.

Superficial Glands of the Trunk.

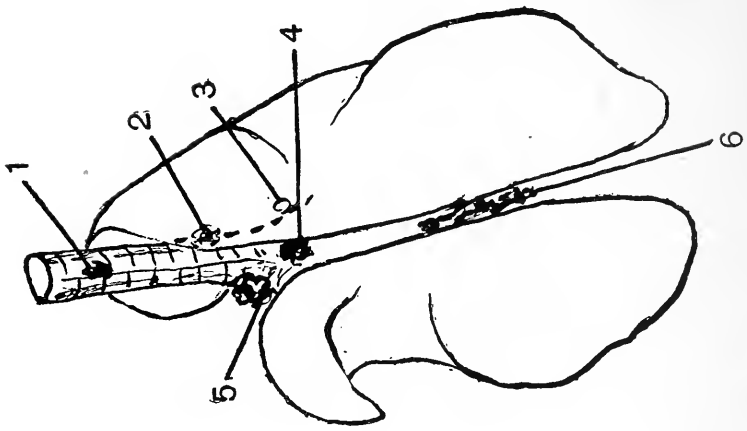
1. Level of Popliteal Lymphatic Gland.
2. Anal Lymphatic Gland.
3. Pre-Crural Lymphatic Gland.
4. Hematic Glands of the Ilio-Aponeuroticus Muscle.
5. Boundary of the Hypochondria.
6. Lymphatic Glands of the Flank.
7. Axillary Lymphatic Glands.

Without separating the three crural masses of the thigh, one can remove this gland with the fat that surrounds it by cutting between the tendinous muscle and the biceps femoris. The line of separation of these two muscles is in that of the prolongation of the external saphena vein, which outwardly follows the external border of the tendo achillis.

CHAPTER IV

Visceral Lymphatic Glands

Lungs. To understand the topographic arrangement of the lymphatic glands of the lungs, it is necessary to explain the anatomical relations existing between the bronchial tree and the blood-vessels, factors of the pulmonary hematosis. In dissecting the bronchial disposition of each lung, it may be observed that, after passing the hilus of each organ, the principal bronchia (bronchial trunk, bronchial root) remains straight, and, while its diameter diminishes gradually, it runs backwards parallel with the dorsal border of the organ, remaining at about one-third of the height of the mediastinal face. Only a thickness of four or five centimeters of inflated pulmonary tissue covers it, and it is only at its much reduced extremity that its dichotomic ramification takes place. On the course of this bronchial trunk, a series of primary bronchiæ branch off, somewhat regularly, varying according to their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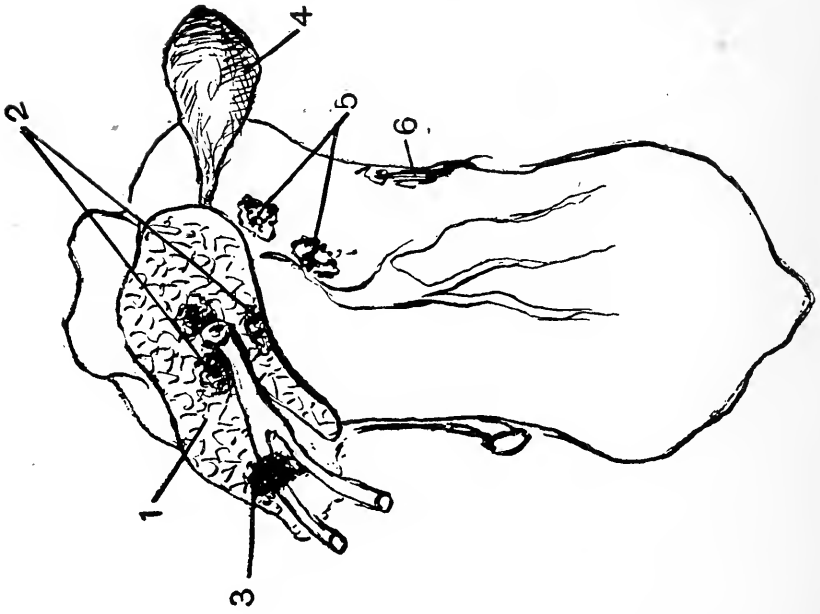
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Fig. 10.

Liver and Lungs of Cattle

A.—Liver.

1. Pancreas.
2. Hepatic Lymph Glands concealed under the Pancreas.
3. A Lymph Gland of the Pancreas.
4. Gall Bladder.
5. Hepatic Lymph Glands in the hollow of the Hilus.
6. Umbilical fissure.

B.—Lungs

1. Prepectoral Gland.
2. Tracheo-Bronchial Lymphatic Glands.
3. Pre-Tracheo-Bronchial Gland.
4. Inter-Treacheo-Bronchial Glands.
5. Pre-Tracheo-Bronchial Gland.
6. Mediastinal Glands.

origin, from the external face of the dorsal, ventral and lateral divisions of the principal bronchia.

Four dorsal, four ventral and four lateral bronchiæ may be counted, the mouths of the dorsal being about opposite those of the ventral, while those of the lateral alternate with the others.

Each principal pulmonary vein is laid under the principal bronchia and inside the points of insertion of the primary ventral ramifications; while, on the contrary, every principal branch of the pulmonary arterial trunk, after twisting forward from the origin of the corresponding bronchial trunk, becomes fixed against it and above the points of attachment of the primary lateral bronchia. It is in the neighborhood of and slightly in front of these bronchial confluents that the *intra-pulmonary* lymph glands are situated. They are generally placed between the artery and the bronchia or again they may be concealed by the blood-vessel.

The glands that accompany the two most anterior, lateral, primary bronchiæ are generally very large, while those which are with the two posterior are reduced to small hematic granulations which are sometimes missing. Notwithstanding their small dimensions, the knowledge of their topographic arrangement is important, as it is well known that the smallest of these organs may become enormous in size, in comparison with its normal size, when tuberculosis has invaded and hypertrophied it.

The most anterior bronchial gland on the left side (left *pretracheo-bronchial*) is that which is most frequently examined. It is situated between the œsophagus, aorta, bronchial trunk and trachea.

In the right lung, the corresponding gland is situated in the bottom of the fissure which separates the supplementary tracheal lobe from the right cardiac. This gland, as large as a pea, lies against the left bronchial trunk and the pulmonary vein, where it is often concealed by the border of the pulmonary tissue. It is by the excision of this border that it can be exposed. When it has been invaded by tuberculosis, and has become hypertrophied, it raises the edge of the lung tissue which covers it, and may then be seen and felt. The gland of the second bronchia is situated, in the right as well as in the left lung, in the bottom of the fissures which separate the cardiac from the diaphragmatic lobes. To discover it quickly on the left side, cut off the anterior bronchia at its insertion and the gland will appear just below.

If one wishes to expose, at once, the whole glandular chain, let him incise the pulmonary tissue from the tracheo-bronchial bifurcation, so as to uncover the bronchial root, and then divide all the dorsal bronchiæ at their insertion. In this way a space, filled with lamellar connective tissue forming a kind of sheath for the pulmonary artery, will be exposed on the external border of the bronchial root. Clean

off the tissue around this blood-vessel, push it aside, then the glands or the lymphatic granulations will be seen.

For the right tracheal lobe, there is also a lymph gland, situated on a level with its hilus, and often concealed by fragments of the right auricle, which may have been cut by a butcher working hastily.

From time to time, along the trachea, to the right and a little above the insertion of the supplementary lobe, there may also be found a gland which belongs to the prepectoral region.

In the angle of the bifurcation of the trachea, there is generally found a small lymph gland, the *intertracheo-bronchial.* When the pulmonary attachments of the posterior mediastinum have not been removed with the lungs, the large, long *posterior mediastinal* gland, also called *oesophago-aortic* or *posterior oesophageal,* may be seen hanging to one of these glands. If the œsophagus has also been left adherent to the lung, one may find above this organ, and on a level with the bifurcation of the trachea, one or two rather large glands, the *anterior oesophageal* or *tracheo-oesophageal.* Again between the trachea and the angle of the two aortae, there is a single glandular mass named the *sub-tracheal.*

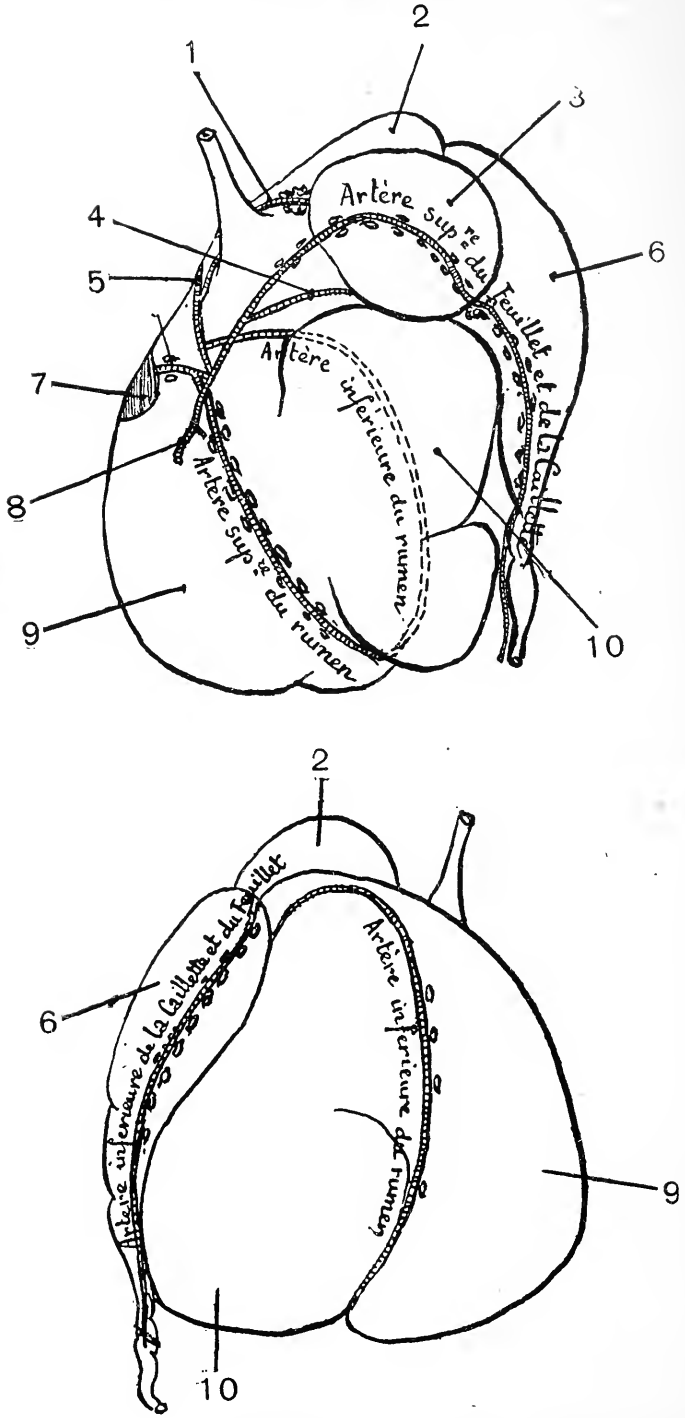
Liver and Pancreas. The lymph glands of these two organs are situated in the hollow of the hilus of the liver, and on each side of the portal vein, to form

an almost complete belt around this vessel. There are generally five glands, the two superior being large and concealed under the pancreas near its insertion on the liver; another, less developed, being placed between the vein and the papillary portion of the lobe of Spigel; a fourth, small also, lying on the ductus choledochus. The fifth is very large and is situated to the right of the fissure, which is opposite the Spigelian lobe. There may also be noticed one or two small glands, which sometimes remain attached to the splenic branch of the portal vein. All these glands are generally surrounded with fat, and, for this reason, it is essential to know their situation well.

To detect the glands of the pancreas, its posterior face must be turned over on the liver so as to expose its anterior surface, and then, on account of the dark grayish tint, the lymphatic glands, surrounded by fat, may be readily seen.

Spleen. There is no large gland appearing on the surface or borders of this organ; however, a few small ones may be met with along the splenic vein and artery, on a level with the serous ligament.

Stomach. The *gastric* lymph glands are arranged in a chain along the blood-vessels, which are distributed on the surface of the stomach, and, on this account, these organs, which are of small size, are found in the bottom of the grooves which separate the compartments of the rumen or they are grouped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Artère inférieure de la Caillette et du Feuillet
Artère inférieure du rumen

Fig. 11.

Stomach of Cattle.

1. Reticulum.
2. Reticulum.
3. Arteries of Omasum and Abomasum.
4. Arteries of Omasum and Abomasum.
5. Artery of Reticulum.
6. Abomasum.
7. Spleen.
8. Iliac Trunk.
9. Rumen.
10. Rumen.

in small numbers in those that separate the omasum, the reticulum, and the abomasum.

Superior face. Alongside the superior artery of the rumen there is a series of glands following the median fissure, and running between the two conical dilatations of the organ. In the small curvature of the reticulum and around the neck of communication of the reticulum and the omasum, there are a certain number of glands, grouped around the superior artery of the reticulum. Along the superior artery of the omasum and abomasum, another glandular chain may be found. At the origin of the small curvature of the abomasum, close to the omasum, the glands are found to be much more numerous and more often in groups.

Inferior face. After turning the stomach over, some glands will be noticed in the bottom of the median fissure of the rumen, along the inferior artery of the organ, and following the entire great curvature of the abomasum; and another series of glands arranged in line along the course of the inferior artery of that organ will also be discovered.

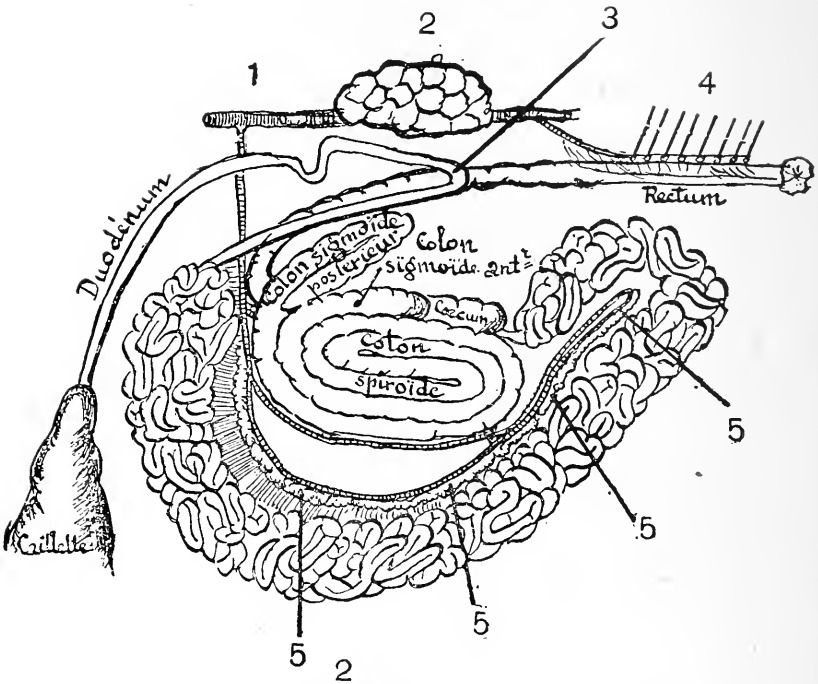
Intestines. The lymph glands of the intestines are distributed along the divisions of the great mesenteric artery.

Those of the small intestines should be examined first. They form between the layers of the mesentery and along the large vascular arches connecting the blood-vessels of this part of the digestive canal,

and consist of two small, glandular chains running alongside of each other and separated here and there. This glandular *mesenteric* cord is especially well developed opposite the circumvolutions of the jejunum and of the ileum, to which they are nearer than they are elsewhere. Close to the ileum, they divide into chapelet and gradually diminish as they approach the end of the small intestines.

To expose the lymph glands of the large intestines, the intestinal mass must be spread on its right face, and the most central loop of the spiroid colon must be carefully isolated, as well as the folds which bind it on the left side. The principal trunk of the colic artery and its ramifications will then be exposed and with it the small glands that run alongside it. Under the most anterior loop of the spiroid colon, at the origin of the great mesenteric artery and near the duodenum and the posterior sigmoid colon, there will be found a group of two or three fairly large glands. The cæcum being then isolated up to the level of the ileo-cæcal valve, some small glands will be exposed, along the curvature of the cæcum and on the course of the cæcal artery. Round the ileo-cæcal valve and generally beyond its insertion, there may be found a very well developed gland, sometimes divided, which is the *ileo-caecal.*

On the course of the small mesenteric artery, near the insertion of the mesentery on the terminal portion of the sub-lumbar colon and of the rectum,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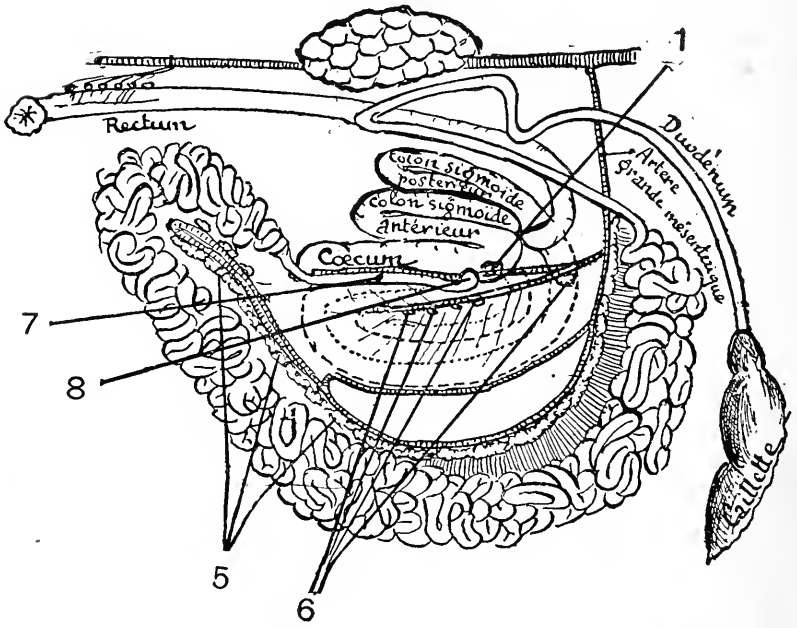
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Fig. 12.

Lymphatic Glands of the Intestines.

1. Aorta.
2. Kidney.
3. Duodenal Arch.
4. Meso-Rectal Glands.
5. Meso-Jejunal Glands.
6. Colic Arteries and Lymphatic Glands.
7. Ileum.
8. Ileo-Cæcal Valve.

there is again a well developed chain of glands, which, in calves prepared by the butcher, may yet remain adherent to the sub-sacral wall.

ADDENDUM

We have omitted, in describing the lymph glands of cattle, the naming of one gland which is imbedded in the fat and situated opposite the external border of the flat surface of the ilium, between the superior insertion of the triceps cruralis, the fleshy portion of the ilio-aponeuroticus, the iliac, and the deep gluteus muscles. Rather constant and as large as a hazel nut, this gland is called the *ilio-crural,* and it is situated on the course of the third vascular branch of the ramification of the circumflex iliac artery. To expose it, one must separate and raise the ilio-aponeuroticus muscle.

This gland has not been found by us in the other species of domesticated animals.

SECTION II

SITUATION AND CHARACTERISTICS OF THESE GLANDS IN SWINE

SECTION II

The Situation and Characteristics of these Glands in Swine.

CHAPTER V

Thoracic Lymph Glands

Entrance to the Chest. The *prepectoral* glands are reduced to: 1. A single sub-tracheal glandular mass, *(prepecto-tracheal)* which is almost always taken off with the trachea at the time of the evisceration. 2. The *axillary* gland, very lobulated and very prominent, lies against the anterior border of the first rib, below the insertion of both the scaleni muscles and the open mouth of the axillary blood-vessels, which become divided here.

Dorsal Region. Between the thoracic aorta and the dorsal vertebræ, and surrounded by a mass of fat, there is a chapelet of glands generally reddish —the *dorso-aortic.* Regularly distributed one by one, opposite the hollow of the body of each of the seven or eight last dorsal vertebræ, these glands are

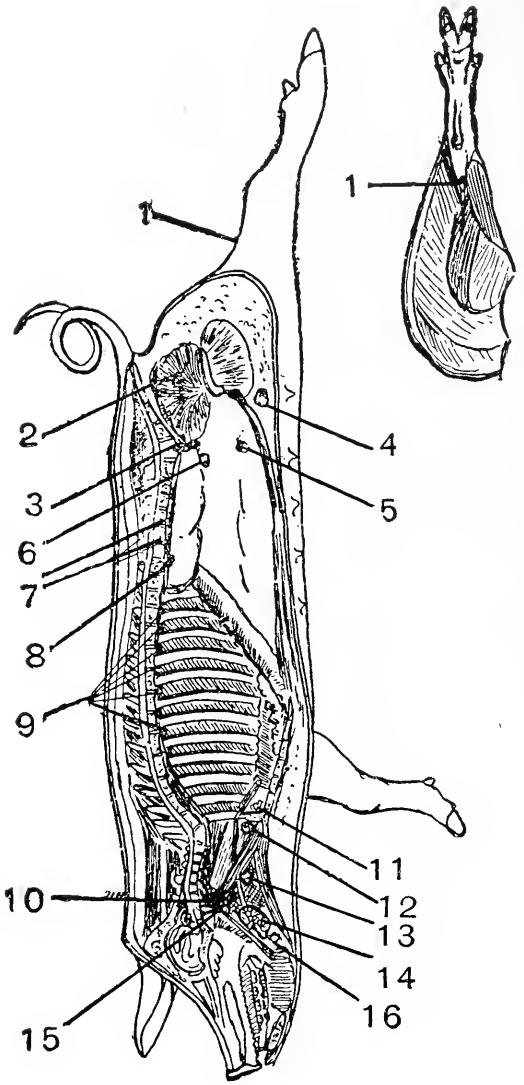
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Fig. 13.

General View of the Lymphatic Glands of Swine.

1. Level of Popliteal Lymphatic Gland.
2. Ischiatic.
3. Internal and Middle Iliac.
4. Inguinal.
5. Pre-Crural.
6. Circumflex Iliac.
7. Lorso-Lumbar.
8. Renal.
9. Dorso-Aortic.
10. Sub-Atloid.
11. Sus-Sternal.
12. Axillary.
13. Inferior-Retro-Parotid.
14. Maxillary Salivary Gland.
15. Superior-Retro-Parotid.
16. Maxillary Lymphatic Gland.

about the size of a bean, the most posterior being generally a little the largest.

Their great number and their development is due to the absence of the intercostal lymph glands and of the posterior mediastinum. Quite often this chain is removed with the aorta by the butcher when the lungs are removed from the thoracic cavity.

Sternal Region. The small lymph glands described in cattle, and found in the lower part of each intercostal space, under the triangularis sterni muscle, are missing in swine. There is to be noticed only on each side of the sternal region the presence of a single *pre-susternal* gland, somewhat large and often of a reddish color and easily seen in a depression left between the first vertebræ of the sternum and the cartilages of prolongation of the two first ribs. The thoracic artery and vein are situated above this gland.

The presence of a *sterno-diaphragmatic* gland in the mass of fat at the point of the pericardium is exceptional.

Very often there may be seen adhering to the tissue above the median line of the sternum, and opposite the first ribs, a piece of the anterior mediastinum, which holds between its layers the more or less atrophied remains of the thymus gland. This organ, which is undergoing regression and is more or less invaded with fat, will be easily differentiated from the lymph glands by its flat appearance, its

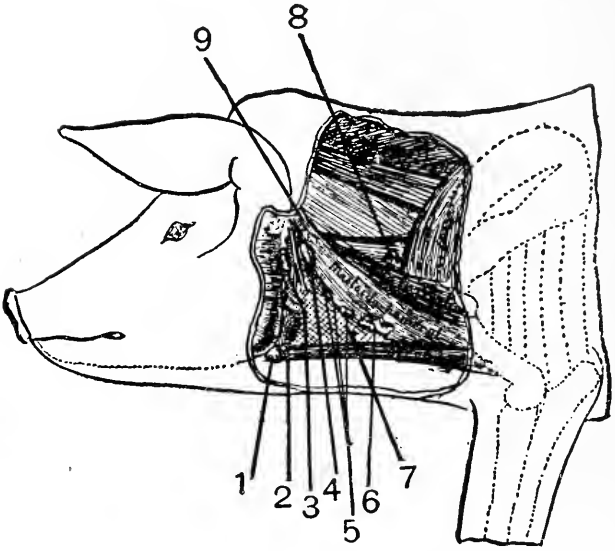
rosy yellowish color, and its softer consistency. It is very apparent in pigs from six to eight months old, which are ordinarily killed for food; while it is very much reduced or even resorbed in sows, and is apt to be entirely resorbed in males eighteen months old.

CHAPTER VI

Swine.—Lymph Glands of the Neck and Head, and of the Anterior Leg.

Lymph Glands of the Neck and Head

The *preparotid* gland is less elongated in swine than in cattle. It forms a lobulated mass lying against the concavity of the posterior border of the lower maxillary bone, and is covered by the anterior margin of the parotid salivary gland. On the same level and against the posterior border of the same gland, there is another lymph gland, almost as large, which belongs to the retro-parotid chain, and which will be mentioned further on. It must not be mistaken for the *sub-atloid* gland, which is situated under the wing of the atlas, in the groove formed by the great anterior straight muscle of the head and the mastoido-humeralis. This last muscle, contrary to what is observed in cattle, remains entirely fleshy as far as its occipito-mastoid insertion, and separates perfectly the two organs just mentioned. The sub-atloid lymph gland may sometimes remain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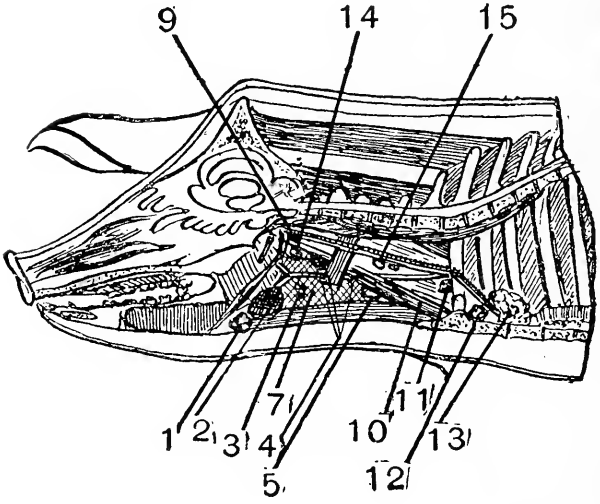
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Fig. 14.

Glands of the Neck of Swine.

1. Maxillary Lymphatic Gland.
2. Maxillary Salivary Gland.
3. Pre-Parotid.
4. Retro-Parotid.
5. Retro-Parotid.
6. Retro-Parotid.
7. Parotid Salivary Gland.
8. Pre-Scapular.
9. Sub-Atloid.
10. Sterno-Maxillary Muscle.
11. Axillary.
12. Pre-Sus-Sternal.
13. Thymus.
14. Superior-Retro-Parotid.
15. Cervical.

adherent to the styloid process, when the head has been amputated too far back.

Generally, in swine, the *retro-pharyngeal* or *sub-sphenoidal* lymph gland is missing.

Along the posterior border of the parotid salivary gland, which is spread on the external surface of the margin of the mastoido-humeralis muscle, it is not rare to see some lymph glands mixed with separated lobules of the parotid. They form the *retro-parotid* lymph chain. At any rate, it may be noticed in swine that the parotid salivary gland extends very far into the cervical region and comes in contact with that of the opposite side, ending in a point quite far down the course of the jugular vein and between the sterno-mastoid and sterno-hyoidus muscles. Above this prolongation of the parotid, there is found on the external surface of the border of the mastoido-humeralis muscle, a large mass of lobulated or conglomerated lymph glands, which has wrongly been considered as the *middle cervical.* Indeed, in other animals, cattle specially, these organs in small number and of reduced size are deeply situated along the course of the carotid artery. In swine, almost always along the course of the carotid artery, and of the internal jugular vein, and altogether on the inner face of the mastoido-humeralis muscle may be found one or two good-sized lymph glands, which may be considered as representing the *middle cervical* glands (the deep cervical chain of man).

All the lymph glands that have just been described and which form a chain along the posterior border of the parotid salivary gland include, then, the *superior retro-parotid,* the chain of the *middle retro-parotid,* and the *inferior retro-parotid.* This last gland, situated in front of the trochiterian eminence of the humerus, is only separated from the skin by an adipose covering, which is divided into two layers by the very thin panniculus muscle. These glands, which may be explored in a lean living animal, may be considered as corresponding to those of the external jugular chain of man.

To find them easily in the animal which is already split in two, without incision of the animal's skin, incise the fat, which envelops them, on the side of the deep layer of the cervical muscles and follow the inferior border of the sterno-mastoid muscle.

At the internal face of the salivary parotid gland and in the neighborhood of the union of the jugular and glosso-facial veins, there are often one or two lymph glands, the *sub-parotids.* By their brown or reddish coloration, they may easily be distinguished from the glandular lobules of the salivary parotid.

The *maxillary* lymph gland is situated against the inferior border of the salivary gland of the same name and that of the maxillary bone. It is always much lobulated, and its consistency is greater than that of the salivary gland which is near it. By manipulation of the region, it may be felt through

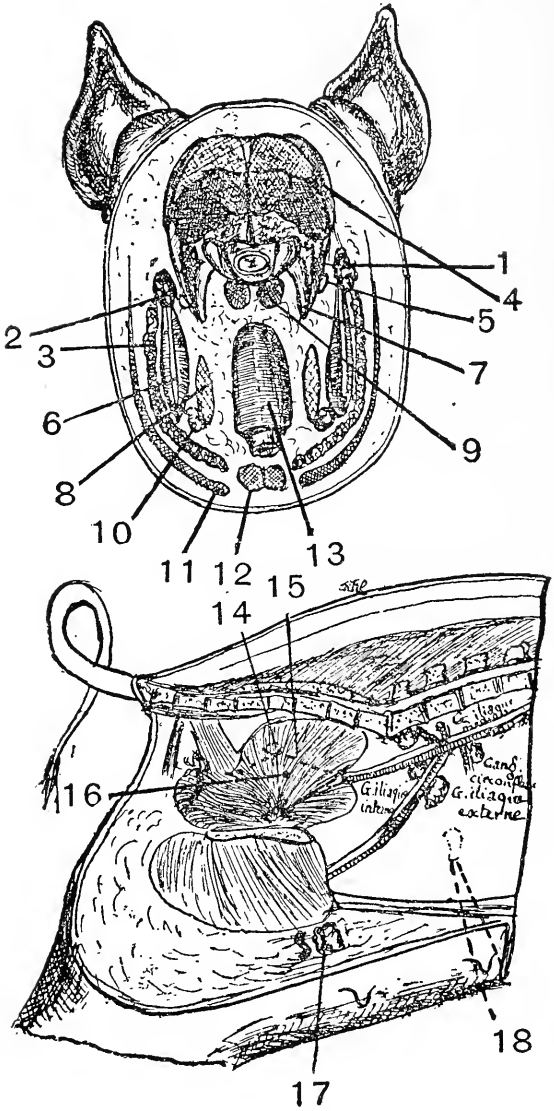
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Fig. 15.

Glands of the Head and Pelvis of Swine.

1. Cleido-Mastoideus Muscle.
2. Pre-Parotid Gland.
3. Parotid Salivary Gland.
4. Mastoido-Humeralis Muscle.
5. Sterno Mastoideus.
6. Maxillary Bone and its Muscles.
7. Styloid Process.
8. Maxillary Salivary Gland.
9. Straight Muscle of the Head.
10. Maxillary Lymphatic Gland.
11. Panniculus of the Neck.
12. Sterno-Hyoideus Muscle.
13. Pharynx and Trachea.
14. Ischiatic Lymphatic Gland
15. Cotyloid Crest.
16. Obturator Muscle.
17. Inguinal Lymphatic Gland.
18. Pre-Crural Lymphatic Gland.

the fat that envelops it. It is easily enucleated from its capsulæ of lamellar connective tissue which isolates it from the fat. It may be readily distinguished from the lobules of the maxillary salivary gland by its lobulation, which instead of being in polyedrical granules and easily separated, is, on the contrary, conglomerated into a muriform mass. Upon section of a decapitated head, there may be generally found a part of the same salivary gland with its lymph gland. On account of the great length and the position of the styloid processes, which look backward, the section should be made some distance from the concavity of the border of the maxillary bone, so as to leave adherent to the head the *preparotid* lymph gland and even a part of the salivary gland, which will have been cut in two.

The cervical portion of the thymus gland, which is found in swine killed during their first year, may be mistaken for the deep cervical lymph glands, when it begins to atrophy, or when it is slashed with the knife after the œsophagus and trachea are taken off. Remains of this organ may also be found all along the inner face of the sterno-mastoid muscle, from the first rib to the styloid process. In the neighborhood of this eminence, an error might be made and it might easily be mistaken for the subatloid lymph gland, which, however, is firm and well lobulated.

It may also be the same for the thyroid body,

which, because of its reddish aspect, could be mistaken for reddish lymph glands of the entrance of the chest. It is known that, on account of the exceptional elongation of the larynx of swine, the thyroid body, lying against the first rings of the trachea, extends down the neck as far as a little below the scapulo-humeral articulation. On account of its slight adherence to the trachea and on account of its navicular form, this organ escapes the action of the butcher's knife when the thoracic organs are removed, and it then remains entire or in pieces attached to the deep muscles of the neck, and at a short distance from the axillary lymph gland. On section, these organs will be easily differentiated by their different color.

Lymph Glands of the Anterior Leg

Below the scapulo-humeral articulation, and close to the common tendon of insertion of the adductor of the arm and of the great dorsal muscle, there can be found a few lymph granulations representing the *tracheal* or *sub-scapular* gland in cattle. The *sus-epitrochlear* lymph gland is wanting in swine.

In front of the shoulder, on the fleshy portion of the antea-spinatus muscle, and a little above the scapulo-humeral joint, is found, surrounded by fat, the *pre-scapular* lymph gland, voluminous in size and formed into a well-defined lobulated mass. The

superior border of the panniculus of the neck is on its level, and, as the anterior border of the trapezius muscle does not reach very low down on the neck, the lymph gland lying on the splenius muscle is found situated, with its fatty envelop, immediately under the skin. On account of the short length of the cervical region in swine, this gland is situated a short distance from the posterior border of the parotid salivary gland and its lymph glands.

CHAPTER VII

Swine.—Lymph Glands of the Abdominal Wall, Pelvic Cavity and of the Posterior Leg.

Sub-Lumbar Region. Opposite the hilus of each kidney, and at the origin and insertion of the aorta and vena cava, of the transverse renal blood-vessels of the loins, there is a group of three or four rather large lymph glands.

Under the loins, there are two *lumbo-aortic* glandular chains, arranged along the aorta and the vena cava and extending backwards as far as the iliac ramifications of those blood-vessels. Below and a little in front of this part, there is a group of five or six sub-lumbar glands a little larger than those in the lumbo-aortic chains, and irregularly arranged.

Iliac Region. The *iliac* lymph glands are distributed in the same manner as in cattle. Sometimes, on account of their lobulated structure, they are separated into secondary glands.

In the angle formed by the two internal iliac arteries, there is found one or two small glands, the *middle iliacs.* The *internal iliac gland* is rather large. The *external* is also large. Below the angle

of the haunch, there is also, in front of the bifurcation of the circumflex iliac artery, a rather large lymph gland, the *circumflex iliac*. In swine, this gland is very near the external iliac gland, on account of the vertical direction and of the small width of the plates of the ilium. The point of the haunch and the lymph gland underneath are thus brought closer to the median line.

Femoral Region. In swine, a *precrural* lymph gland is found, large and well lobulated, situated, as in cattle, adjacent to a mass of fat that lies against the abdominal wall, likewise against the triceps cruralis muscle. It is sometimes situated a little higher up than in bovines. To expose it, in the sow, after removing the fat, divide the abdominal muscles, following a vertical line extending from the middle of the last lumbar vertebra to the second teat, when it will be met at about the height of the place where the prepubic tendon passes between the muscles of the flat of the thigh to go, and be inserted in spreading under the ischio-pubic symphysis.

On the course of the external pudic artery, and below the funicular part of the prepubic tendon, there is the *superficial inguinal* lymph gland, forming a much lobulated mass, sometimes partially divided and situated in the middle of the fat of the groin, from which it can be isolated by an incision running from the anterior border of the pubis to reach the last teat. If this has been scraped when

the animal was dressed, the incision will have to be extended to the anterior border of internal straight muscle.

It is exceptional to find on a level with the triangle of scarpa, lymphatic granules representing the *deep inguinal* gland.

Tibial Region. The *popliteal* gland, which is about as big as a pea, instead of being deeply situated between the gemini of the leg and the anterior border of the semitendinosus muscle, as in cattle, is located much lower down, and almost under the skin, in the space left between the semitendinosus and the biceps cruralis. To expose it, one will make, along the external border of the tendo achillis, a longitudinal, cutaneous incision, a little oblique, from outwards inwards, so as to show the external saphena vein; then, following this blood-vessel as far down as the point where it enters the space of the two muscles above mentioned, the gland will then be found embedded in the fat. Before making this dissection, one may also detect it in the small longitudinal depression known as the popliteal space. But a little practice will be necessary even then, to enable one to succeed in finding the gland by palpation.

The presence sometimes of very small glands has been mentioned found in front of the tendo achillis and back of the articulation. They are, however, seldom present.

Pelvic Region. Let me mention, first, below each sacral articulation with the coxæ, the presence of a *lateral sub-sacral* gland, which is often removed with the genital organs and the rectum.

The *ischiatic* gland is not situated exactly opposite the small sciatic notch, as in cattle; it is much more forward. The anatomical data given to find this gland in cattle are no longer the same. The internal iliac artery, instead of continuing to lie against the internal wall of the pelvic cavity, comes out through the great sciatic notch to run on the external face of the sacro-sciatic ligament, along the sus-cotyloid crest; it afterwards enters by the small sciatic notch to ramify further on, through its branches, the genital organs and the rectum. The ischiatic lymph gland, sometimes double, is found on the external course of the blood-vessel. To expose it, incise first the internal obturator muscle, which, in swine, extends over the sacro-sciatic ligament and covers it as far as the sacrum, then divide the ligament along its insertion on the sus-cotyloid crest, which in pigs is very high and convex. The gland will be seen opposite the first or the second vertebræ and lying against the artery, a little back of the summit of the sus-cotyloid crest, which in pigs is very high and convex. The absence of this gland is frequent in swine.

Round the anus, the *anal* glands are found.

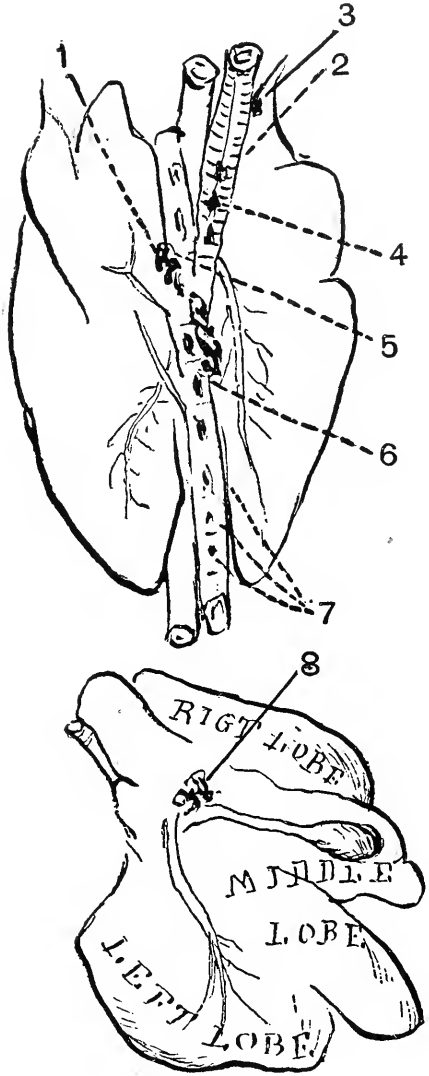
CHAPTER VIII

Visceral Lymph Glands

Lungs. Often, when the pectoral viscera are taken from this cavity, the thoracic aorta is at the same time pulled out entire and remains adherent to the lung and to the œsophagus through the presence of the posterior mediastinum. The sub-vertebral fatty cord, which surrounds the dorso-aortic lymph glands, remains attached to the artery.

In swine, contrary to what is done when withdrawing the thoracic viscera from cattle, the œsophagus is cut off near the cardia, when the evisceration is done, and remains attached to the mass formed by the lung, aorta, heart and trachea. Therefore it is easy to study all the lymph glands of the thoracic organs in their normal relations.

The *oesophageal* gland of the posterior mediastinum is wanting in swine. The *pretracheo-bronchial* of the left lung is well developed. Immediately in front of it, and above the recurrent nerve, between the trachea, the cross of the aorta and the œsophagus, there is found another elongated large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RIGHT LOBE
MIDDLE
LOBE
LEFT LOBE

Fig. 16.

Lungs and Liver of Swine.

1. Pre-Tracheo Bronchial Gland.
2. Tracheal Gland of R. Lobe.
3. Sus-Tracheal Lymphatic Granulations.
4. Pre-Tracheo Bronchial Gland.
5. Tracheo-Œsophageal Gland.
6. Inter-Tracheo Bronchial Gland.
7. Dorso-Aortic Gland.
8. Lymphatic Glands of the Hilus of the Liver.

gland, the *tracheo-oesophageal.* In the angle formed by the tracheal bifurcation, there is also one *inter-tracheo-bronchial* gland, fairly large. The anterior lobe of the right lung is, as in cattle, provided with a special bronchus, fixed alone on the trachea, and provided with two lymph glands situated at its insertion, one below the end of the bronchus, near the point of the entrance of the pulmonary blood-vessels, and the other forward on the summit of the tracheo-bronchial angle.

The middle lobe of the right lung seems to form body with the tracheal, although it only lies on it as well as on the diaphragmatic lobe. It is provided with a bronchus, distinct from that of the other lobes, and in the angle that this forms with the trachea, there is a large interlobular gland, which is exposed by cutting off the margin of the lung as it adheres to the right side of the trachea. Finally, between the anterior lobes of the lungs, there is, on the median line of the superior face of the trachea, a chain of elongated lymphatic granules. Often, also, below and on the right of the middle part of the trachea, there is a prepectoral gland which has been left adhering.

The *intra-pulmonary* glands of the diaphragmatic lobes are not very apparent in swine.

Liver. It is rare to find lymph glands adhering to the liver of swine, because the pancreas has in this animal no continuity with the liver, and the

pancreatic glands, in relation with the fissure of the portal vein, cannot be seen as they can in cattle. Those which belong to the organ itself are two or three in number, and are usually situated on the vascular peduncle of the hilus of the organ. This cord, being generally cut through by the eviscerator close to its insertion, the *hepatic* lymph glands are rarely found in their position by the veterinary inspector. To find them, one must look in the neighborhood of those of the pancreas.

Pancreas and Stomach. In swine, the pancreas is situated above the small curvature of the stomach a little back of the cardia. Attached to this viscus by the small omentum, it is by one of its extremities (the tail of the pancreas) adherent to the large curvature of the stomach, and by the other (the head of the pancreas) to the pylorus and the duodenum. This organ presents, near its head, a mass of three or four large glands, which are laid on the right *cul de sac* of the stomach. These are the *pancreatic* lymph glands having near them the *hepatic* glands.

Under the other extremity of the pancreas and below the lower portion of the small curvature of the stomach, where the gastric artery bifurcates, there are two or three glands, somewhat voluminous. They are the *gastric.*

Spleen. There exist two or three small glands, called *splenic,* arranged in the neighborhood of the tail of the pancreas and along the cord formed by

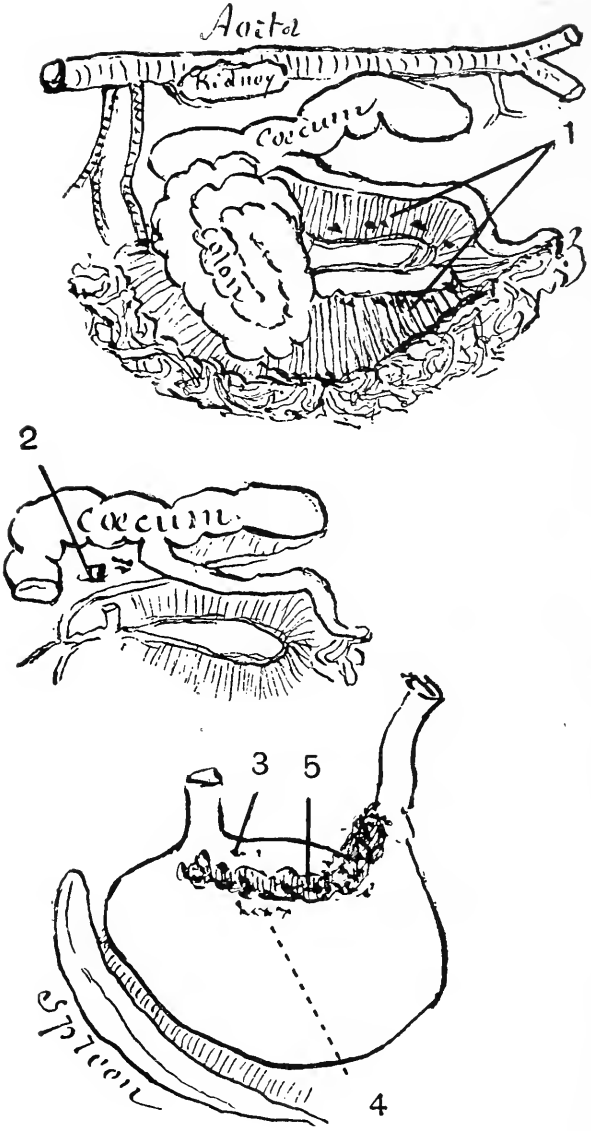
Aorta
Kidney
Coecum
1
Colon
2
Coecum
3
5
Spleen
4

Fig. 17.

Lymphatic Glands—Abdominal Viscera of Swine.

1. Gland of Small Intestines.
2. Cœcal Gland.
3. Pancreatic Gland.
4. Gland of Small Curvature.
5. Pancreas.

the blood-vessels which run into the spleen, between the folds of the meso-splenic ligament.

Intestines. All along the collecting vessel of the vascular apparatus of the small intestine and on each side of this, there is found, under the serous membrane, a long sinuous glandular chain, appearing to form a single chain with that of the opposite face. That of the left face is broken up in close chapelet, while the right forms a continuous band. While in cattle those lymph glands form a curve, situated a short distance from the insertion of the mesentery or the intestine, in swine, on the contrary, because of the greater extent of the vascular arches, these chains of lymph glands are closer to the center of the mesentery. Towards the extremities of the jejunum and opposite the duodenum and the ileum, these mesenteric lymph glands are dissociated and increasingly further apart.

Along the cæcum and in the neighborhood of the ileo-cæcal valve, there will be found, as in cattle, groups of fairly large glands. They are easily detected when one looks toward the end of the ileum.

To expose the glandular chain of the large colon in swine, the peritoneum and fat around the helicoid twists of the organ must be first lacerated, beginning with the most central. Then, by slight pullings, the colic loop in its entirety will be unrolled. The two branches of the colic artery, with their numerous branches, will then be stretched, and, alongside their

course, a chain of numerous glands, specially well developed near the great mesenteric artery, will be found.

Along the small mesenteric artery, and at the point of insertion of the mesentery on the colon and rectum, a glandular chain, similar to that of cattle, will be seen because it is readily apparent.

SECTION III

SITUATION AND CHARACTERISTICS OF THESE GLANDS IN SHEEP AND IN THE HORSE

SECTION III

The Situation and Characteristics of these Glands in Sheep and in the Horse.

CHAPTER IX

SHEEP.—GENERAL REMARKS AND SOME PARTICULARS.

The lymph glands in sheep are exactly the same as those mentioned in cattle. The deep *inguinal* gland is often found, and is situated under the peritoneum on a level with the superior opening of the inguinal canal, near the posterior abdominal artery. The *anal, ischiatic* and *iliac* glands are quite large and those of the *sub-lumbar* chain are almost all hematic. The *dorso-aortic* are well developed and are found in great number, while the *intercostals* are seldom observed.

The *presusternals* are voluminous and the *sus-sternals* are represented rarely by granules.

The lymph glands of the cervical region, the head and viscera present nothing in particular.

CHAPTER X

Lymphatic Glands in the Horse. Thoracic Lymph Glands. Visceral Lymph Glands.

In the horse the lymph glands are noticeable because of their condition of dissociation and their color, which is generally of a reddish tint. There are many differences from the disposition noticed in cattle and swine.

Thoracic Lymph Glands

The *axillary* form, against the anterior border of the first rib and below the scalenus muscle, a large glandular mass, much lobulated and even partly dissociated. The *internal prepectorals* are always removed with the trachea.

The *presusternal* is missing and those described in cattle as lying under the triangularis sterni muscle, are rarely seen, or, if seen, found to be reduced to exceedingly small granules. The same is true of the *sterno-pericardial* gland.

Lymph Glands of the Head and Neck

The *preparotid* gland is much reduced in size, and, instead of overlapping the salivary parotid in front, as in cattle, it is located in a fissure in the deep face of that gland, close to the auditory canal.

The *maxillary* or *sub-glossal* gland forms an elongated mass, divided into four or five lobules, contiguous with and lying under the tongue near the median line.

On account of the presence of the guttural pouches in horses, the *retro-pharyngeal* and *sub-atloid* lymph glands are pushed back below the pharyngeal region so as to form a more or less voluminous mass of lymph glands lying against the lateral walls of the lower part of the pharynx, and under the carotid division.

Under the deepest part of the region of the jugular groove and along the carotid artery, there may be seen, in link formation, a few lymph granules, which increase in size towards the posterior extremity of the salivary parotid and opposite the bifurcation of the jugular, which are called the *middle cervical* glands.

Lymph Glands of the Anterior Extremity

Inside the omo-trachelian muscle, there may be seen a *prescapular* gland, less developed than in cat-

tle, yet forming a lobulated mass. The hematic glandular chain of the anterior border of the shoulder, which has been described in cattle and which is found in that species along the ascending branch of the inferior cervical artery, is rarely observed in the horse.

The *sub-scapular* gland is small. In horses, there may be found inside the inferior extremity of the humerus three or four large, lobulated glands, named the *sus-epitrochlear*.

Lymph Glands of the Abdominal Wall and the Posterior Extremity

There is also in the horse a *renal* gland opposite the hilus of each kidney. The lumbo-aortic glands form a chain of lobules spread on each side of the aorta.

In front of the aortic quadrifurcation, the glands of the *sub-lumbar* chain become very large. There is also a *median* and an *internal iliac* gland in the same situation as in cattle. The *external iliac* gland is quite large and, instead of being located the same distance from the confluence of the pelvic crural blood-vessels, it is, on the contrary, close to it and almost united with the sub-lumbar chain of lymphatic glands.

In place of a single *circumflex iliac* gland, we find in the horse two glands. One is in the fork of the

two terminal branches of the blood-vessels of that name, and the other is more forward.

There is no gland on the external surface of the hollow of the flank.

The *precrural* gland is smaller than in cattle and composed of four or five conglomerated granules.

In the neighborhood of the external inguinal ring, the *superficial inguinal* gland is found formed of from six to eight lobules.

Below the pelvic border, and under the crural arch, a group of seven or eight lymph glands, quite large, is seen almost entirely covering the surface of Scarpa's triangle. They are the *deep inguinal* lymph glands.

There is no *ischiatic* gland in the horse, and the *popliteal* gland is divided into two or three lobules which occupy the same position as the single gland does in cattle.

Visceral Lymph Glands

The stomach, on a level with the small curature, has two or three well developed glands and there are a number of granules along the insertion of the omentum.

The small intestines have a chain of *mesenteric* glands, formed into about thirty groups, quite large, and near the ramifications of the great mesenteric

artery. Along the cæcal, ileo-cæcal and colic arteries, long chapelets of small glands may be found.

The small colon and rectum of the horse have also a glandular chain as is the case in cattle and pigs. Round the anus, *anal* glands may also be detected.

The liver and pancreas have lymph glands which are mixed in a single mass along the course of the portal vein and in proximity to the hilus.

The spleen has, in its groove, a certain number of small granules.

The lungs show the *pretracheo-bronchial* and *intertracheo-bronchial* glands. Between the anterior aorta, the trachea and the œsophagus, may be noticed the presence of a group of large glands, named the *anterior oesophageal.* In the posterior mediastinum, and along the œsophagus, are found some rudimentary granules, which would be the *posterior oesophageal* lymph glands.

PART II

THE NORMAL APPEARANCE OF LYMPHATIC GLANDS IN MEAT-PRODUCING ANIMALS AND PATHOLOGICAL ALTERATIONS OCCURRING IN THEM

SECTION IV

THE NORMAL APPEARANCE OF THESE GLANDS AND THEIR PRODUCTS

PART II

NORMAL APPEARANCE OF LYMPHATIC GLANDS IN MEAT-PRODUCING ANIMALS

SECTION IV

The Normal Appearance of these Glands and their Products.

CHAPTER XI

THE HISTOLOGICAL CHARACTERISTICS OF NORMAL LYMPHATIC GLANDS.

Before considering the pathological alterations that occur in the lymphatic glands, we shall, in a summary manner, glance at the normal characters of these organs, with, moreover, the variations of structure which they may offer, according to the species, the age of the animals, and some of the physiological conditions.

The single elementary lymphatic gland is composed of a nodule of homogeneous substance made up of cells (leucocytes) heaped against each other

between the flexuous and anastomotic meshes of a network, which is the entrance of the lymphatic capillaries. The closed follicles, isolated or collected as in Peyer's patches, which are seen in the intestinal mucous membrane, are analogous to those single glands.

In the glands more perfectly developed, the ramifications of the lymphatic capillaries enter the glandular substance, dividing it into irregular or rounded segments, called *follicles*. The organ is thus formed of a mass of elementary glandioles, more or less regularly conglomerated.

If, under low power, a section of one of these compound glands is examined microscopically, a conjunctive *capsule* is observed on the periphery, enveloping the mass of the lymphoid bodies and sending from its inner face, and toward the center of the organs, more or less numerous *septa,* limiting the masses of follicles on the external surface. The presence of these *septa* is indicated by fissures, which give to the envelop a bosselated or roughened appearance.

Inside the *capsule,* there is a cortical layer of areolar tissue, made of cellulo-fibrous trabeculæ, which is stretched between the septa and the capsula and which serves as a support to the lymphoid follicles. The empty spaces left between the septa, the capsula and the follicular masses, form the *cavernous sinuses.*

In the medullary portion of the gland, the lymphoid follicles of the cortical layer may be seen tapering off to form the follicular cords. The prolonged cavernous sinuses, which separate them, widen and unite to give rise to the *efferent collectors.*

While some follicles offer an homogenous aspect and are filled with packed leucocytes, others present, in the center, a white spot, due to the existence of a fine reticulum surrounding great clear cells (great mononuclear), provided with one single large nucleus, enclosed in a reduced basophilous plasma. These collections of great follicular leucocytes are in constellation with a great number of cells in process of karyokinesis. For this reason, Flemming has given to the clear part of the follicle the name of *germinative center.*

To the naked eye, the rounded masses of follicular substance appear to have the aspect of firm pulpous surfaces, a little elevated on account of their turgescence, because they allow an abundant lactescent juice to escape on pressure. The medullary zone, on the contrary, has a bistre tint and permits a clearer liquid to escape.

On a level with the hilus, the capsule inflects itself so as to dip into the organ, resting upon itself and forming a fibrous expansion, nacreous in aspect, called the *Albuginia stroma of the hilus.* This system, which serves as a support to the blood-vessels, becomes fringed to unite with the septa, before men-

tioned. The fibres of the divisions of the reticulated tissue separate easily from those of the septa. The blood-vessels of the septa are distributed in a fine capillary network among the follicular masses.

CHAPTER XII

The White Globules or Leucocytes.

The *white globules,* or leucocytes, found in the lymphoid gatherings, are of several kinds. They vary according to the aspect of their nucleus, the homogeneity of their protoplasm and the tinctorial affinities of some granulations that may be enclosed. The analysis of these elective properties for coloring has permitted Ehrlich to establish a classification of leucocytes. Considering the anilin coloring matters as salts, this bacteriologist has designated under the name of acid, or basic colors, those leucocytes the coloring action of which is due to the acid or the base, and under the term of *neutral* those effect of which can be attributed to both the base and the acid.

1. Acid colors: Eosin, Orange, Fuchsin.
2. Basic colors: Blue of Methyl, of Unna, Green of methyl.
3. Neutral colors: Ehrlich's mixture (green of methyl, orange, and fuchsin).

The leucocytic cells are called *acidophilous, basophilous,* or *neutrophilous,* according to their properties: if they take acid or basic colors indifferently, they are called *amphophilous.*

They have been classified as follows:

1. Small *mononuclear* or *lymphocytes.* These have about the dimension of hematics, from five to eight μ. The protoplasm is not granulous and not abundant, slightly basophilous, with the nucleus relatively large and with weak tinctorial affinity. These are seen in the blood (22 to 25 per cent of white corpuscles), where they are very numerous, and in the lymphatic organs. In the glands they are uniformly scattered, while they are rare in the connective tissue. They develop in the middle of the lymphatic glands and the follicles of the spleen. They are generally considered as young elements, although some authors take them to be degenerated leucocytes with reduced protoplasm. In some pathologic circumstances they may carry neutrophilous granulations. They are not phagocytes.

2. *Large mononuclear.* These are large cells, being fifteen to twenty W. (*i. e.,* microns) in diameter and more or less oval, with excentrical nucleus. The protoplasm is not granular, has little coloring matter, and is less basophilous than the nucleus. The large mononuclear cells are very phagocytic (macrophage leucocytes of Metshnikoff). They are rare in the blood (one to four per cent of white

corpuscles), abundant in lymph, and specially numerous in lymphatic glands. They increase in leucemia.

3. *Polynuclear with Neutrophilous Grains.* The diameter is from ten to fourteen W. They have a distorted polymorphous nucleus, constituted by three or four nuclear masses, easily colored and united by more or less delicate threads. The protoplasm is sprinkled with neutrophilous granulations. They have powerful phagocytic properties and form the greater part of the leucocytes of the blood (70 to 75 per cent of the number of white corpuscles). They are rare in the glands and spleen but are frequently found in the marrow of bone. Their number increases in the glands during infection.

4. *Polynuclear with Acidophilous Grains.* These are a little larger than the preceding, eight to ten W, with a baggy nucleus, they are generally formed by nuclear masses with little coloring matter, and are united by one thread. They contain protoplasmic granulations which color strongly with acid colors (eosin, rubin). Small phagocytic properties are noticeable. They are rare in the blood (two to four per cent of white corpuscles), but are frequently seen in lymphatic organs.

They are principally numerous in the lymphatic glands at the origin of the follicular threads. In general, the eosinophilous cells disappear during the course of acute diseases.

Eosinophily is marked in intoxications, after injections of tuberculin, in helminthiases, and it is sometimes very severe in lucemia.

5. *Basophilous-polynuclear.* (Mastzellen.) The dimensions are from eight to twelve μ They have an irregular polymorphous nucleus, colored by the polychromatous blue of Unna. The protoplasmic granulations take the Gram and the Ziehl stain, but discolor with carbonate of potass, while the microbes do not. They are rare in lymphatic glands.

Granular leucocytes arise in the bony marrow, and on that account are called *myelocytes* in their young state. The nucleus is single, round, and situated in the center of the protoplasm, and when mature, it becomes polymorphous and the leucocyte, reduced in size, leaves the bony marrow to enter the circulatory current.

Normal blood contains adult granular leucocytes in constant proportion; the relative number of the various species varies according to the age of the animals. The blood of old subjects contains more polynuclear cells, while that of young animals is richer in lymphocytes.

The leucocytic formula of the blood of young subjects is characterized by lymphocytosis. The proportion of lymphocytes and mononuclear leucocytes is from 50 to 70 per cent, and the remaining blood is represented by 50 to 30 per cent of polynuclear leucocytes. In adult animals the polynuclear

cells are, on the contrary, in majority. By these figures one may judge the creative activity of the glands during youth, since the lymphocytes and mononuclear leucocytes alone proceed from the lymphatic glands, while the others come from the spleen and the marrow of bones.

Most infectious fevers are accompanied by neutrophilous leucocytosis, and the quantity of eosiniles diminishes and may be altogether absent. When the temperature becomes normal again, the eosinophiles reappear in the blood. Eosinophily is also observed in parasitic and cutaneous diseases.

Mononuclear leucocytosis is especially to be observed in palustral infections.

CHAPTER XIII

Variations in Structure of Normal Lymphatic Glands and the Reasons for them.

Varieties of Structure. In young animals, upon sections of the glands, the spaces occupied by the lymphoid surfaces are greater than those upon the browner, medullar, cavernous zona, and in old animals the lymphoid zona becomes so rarefied that it only appears as a thin peripheric band. At any rate, the leucocyto genesis is considerably reduced in the germinative centers.

In swine,, the lymphoid follicles, instead of being of small dimensions and grouping themselves in peripheric sheaths, gather in voluminous spheroids, irregularly distributed in the organs and separated from each other and from the capsule by thick septa of cavernous tissue. The capsule, depressed by grooves, sends out deep septa which divide the organ and give it a marked glomerulated aspect. In horses, the lobulation is carried to extreme and then the organ is dissociated into groups of small glands. The same condition exists in man.

In some regions of the body, small glands may be observed which are blood-red in color and have been named *hemo-lymphatic,* or hematic glands. Some authors (*Seydig, Gibbes, Robertson, Clarkson, Scott, Warthin, Morandi,* and *Pietro Sixto*) believe that these organs contribute to hematopoiesis. Their action resembles that of the spleen, and *Forgeot* has demonstrated, moreover, that in ruminants the glands are not only leucopoietic centers but that they can also contribute to the formation of hematids.

In cattle, these organs can be found in the hilus of rather large glands, and some, with spherical or discoid form, have been found under the skin. We must mention, moreover, those situated at the dorsal angle of the shoulder, in the hollow of the flank, just below the point of the hip, and on the surface of the ilio-aponeuroticus muscle, along both the anterior border of the shoulder and of the sub-lumbar aorta, especially in sheep.

On section of these small glands, notwithstanding the very dark coloration of their pulp, a sub-capsular zona is observed, formed of follicles of purplish color, and distinguishable with difficulty from the surrounding tissue, which is a little redder in color. Microscopical examination with low power is sufficient to make out their structure.

Often, in adult animals, some of those hematic glands lose their reddish coloration to take on ex-

actly the characters belonging to the ordinary glands and then the great hematopoietic action of these organs can be reduced.

In swine, it is rare to meet hematic glands, but upon some lymphatic glands (ilio-pelvic, dorso-aortic, prepectoral and preparotid) the cavernous zona under the capsule often takes on a dark red color, which extends more or less within the inter-follicular septa and gives to a section of the gland a peculiar dappled coloration comparable to that of a nutmeg.

It is important to note the difference in the characteristics of the lymphatic and hematic glands, as it permits one to avoid the error of taking as pathological the bloody coloration which characterizes the special physiological action of some of these organs.

SECTION V

PATHOLOGICAL ALTERATIONS OCCURRING IN LYMPHATIC GLANDS OF MEAT-PRODUCING ANIMALS

SECTION V

Pathological Alterations occurring in Lymphatic Glands of Meat-producing Animals.

CHAPTER XIV

GLANDULAR ALTERATIONS DURING ACUTE FEBRILE DISEASES; SCLEROSIS; LYMPHADENIA; TUMOR FORMATION; EMPHYSEMA.

Acute Diseases. When, under the influence of acute diseases, circulatory troubles give rise to congestions in the visceral organs or the surrounding peripheric capillary network, the lymphatic glands partake also of these congestive effects. It may even be said that in the slightest febrile states their tissue is the seat of a noticeable hyperemia.

Instead of showing, upon a section, the clear color that is proper to them when they are bloodless, they present, especially on a level with the medullary portion, a coloration which varies from a slight rosy tint to that of red wine, which is either uniformly spread over the surface of the section or mottles it with more or less defined coloration of varying ex-

tent. If, in consequence of a greater severity of the disease, the hyperemia is even more marked, the coloration then spreads to the cortical portion of the gland, and the peripheric sub-capsular sinuses and the perifollicular also show often a manifest hemorrhagic pricked appearance, and the lymphoid plates may even become partially injected. At the same time, the glandular lymph becomes more abundant and fills to excess the various portions of the organ, especially those of the center. The gland then becomes enormous and turgid.

When histologically examined, this pathological condition of the gland is indicated by a great injection of the capillaries, with active diapedesis of the hematids, especially on the level of the cavernous perifollicular sinuses. There may also be a rupture of the capillaries with production of hemorrhagic centers. At the same time, one may find in the glandular tissue a great quantity of polynuclear leucocytes with neutrophilous grains which ordinarily exist only in the blood.

The inflammatory congestive state is often accompanied by an obstruction of the lymphatic canals, caused by precipitation of fibrin, when the organ becomes hard and on section shows yellowish stringy exudates. The follicles also become hypertrophied, but they are never invaded with polynuclear leucocytes. Complete disparition of eosinophilous leucocytes is at the same time observed.

In animals destroyed during the course of acute diseases, the prescapular glands are the first that show especially, and with the greatest severity, the congestive effects of the febrile reaction. For this reason they are the most advantageously examined whenever meats look suspicious in their general appearance. The capillary network of fat which surrounds them undergoes, likewise, to a very great degree, the effects of the circulatory stasis. It must also be remembered that in animals that have remained lying down during their sickness, the hypostasis and the difficulty of the returning circulation, contribute to some extent to the degree of intensity of the bloody affection of the organs under consideration. The iliac and popliteal glands may give similar indications of circulatory changes, although less marked in degree. In leucemia the glands may also often show a reddish prickled (petechiated) appearance and a certain degree of follicular hypertrophy. In these cases, the surrounding fat of the prescapular gland remains bloodless.

In sick swine, the follicles of the glands with the hematic capsules are intensely congested. These organs are of a reddish tint on the entire surface of a section. In the same animal the maxillary lymphatic gland may be examined with advantage, as it generally presents a greatly marked hyperemic state during acute diseases.

Sclerosis. In severe adenitis, the lymphatic

glands may be invaded with fibrous tissue. In aged male and female pigs, the glands of the head, and specially those of the parotid, are frequently the seat of well-marked sclerosis. The diseased organs are hard, knotty and on section they have a yellowish, gray aspect, while their atrophied, lymphoid follicles are changed into a more or less dense fibrous tissue. These lesions may be attributed to the local infections to which animals are exposed by the bites they inflict upon each other (erysipeloid of the auricular concha). They may also be caused by inflammations of the pharyngeal mucosa.

Lymphadenia. The lymphogenous diathesis gives rise in animals, specially in bovines, to large glandular hypertrophies, the aspect of which differentiates them well from neoplastic or tuberculous alterations.

Instead of being bosselated, the glands keep their original form, and on section they appear, generally, of a white or a little grayish tint, at times partly colored with spots of red wine hue, more or less altered (rapid hypertrophy). They are soft in consistency, and a milky fluid escapes from the cut surface. The structure is homogeneous, and in no part are lesions observed indicating the slightest progress of regression of the cellular elements. There is indeed no indurated, nor softened, purulent, or caseous center. With the microscope, one observes that the hyperplasia is due to the enormous

development of the follicles; and that the adenoid tissue undergoing intense proliferation is the only cause of the increase in size.

Most of the glands of diseased animals are altered at the same time.

Tumors. Sarcomata and epitheliomata are among the neoplasms that may invade lymphatic glands.

In cattle, sarcomatous lesions are frequently observed, being sometimes those of the *encephaloid* variety, or *globo-cellular* with round cells, and at other times of the fasciculated type with fusiform cells. The glandular lesions of the globo-cellular sarcoma generally co-exist with other products of miliary aspect and are soft, grayish, simulating tuberculosis at first sight, and disseminated in the subcutaneous and intermuscular connective tissues. They may spread also into sheaths, adhering well to the surface of the serous membranes under the form of grayish vegetation, and not calcified nor caseated.

In a horse affected with *melano-sarcomatosis,* the lymphatic glands are generally partly affected with neoplastic growths; they are increased in size, and have on their surface a stale, gray coloration with more or less dark reflections. On section, these neoplasms have a color which varies from dark gray to sepia or black. They are hard, resistant, and rough under a sharp instrument. With the microscope, there may be noticed the presence of fasciculi

of fusiform cells, arranged irregularly in the center of an amorphous substance. These cells, starred with thin prolongations, are multiple or fusiform and more or less filled with black, spherical corpuscles, which fill completely the most diseased cells. Their nucleus finally disappears, and, later, as the cells become old and pigmented, they have a tendency to assume the spherical form.

Melanin is a pigment of the same nature as that which is found in the cells of the mucous bodies of the Malpighian layer; that is, the colored part of the skin of animals; also in the fibrous membrane of the choroid, and sometimes in the pia mater. This pigment contains sulphur, carbon, hydrogen and nitrogen. Some authors claim that this substance is derived from hemoglobin, and others that it has an autochthonous cellular origin.

Pigmentation. Lymphatic glands may be colored black not only by a heterotropic deposit of melanin, but also by pigments of hematogenous origin or by the penetration of particles of coal.

In visceral congestions, the coloring matter of the blood, as an extravasate of the capillaries, may give rise to deposits of granulations, pigmented in a more or less dark red or black color. In intermittent fevers of man, the infiltration of some viscera (liver, lungs) with a similar pigment has been observed, due to the excessive destruction of the red globules in the spleen, after repeated congestion and

because of extravasate being absorbed from that organ (melanemia).

In some cases, the black coloration of the prebronchial lymphatic glands may have been caused by the repeated congestions of both the bronchi and the lungs that animals have in cases of bronchitis and pneumonia.

Rebsamen has written an important work on this subject.

The thoracic visceral glands may also be partly pigmented by the penetration of particles of coal, introduced into the respiratory tract. The pigmentary particles are generally accumulated at the level of the interfollicular sinuses and form on the periphery of the gland a more or less black, festooned border. *Oesterlein, Robin, Villaret, Kleimann, Calmette, Vansteenberghe,* and *Grisez* say that anthracosis of the lung and of its glands is, above all, of intestinal origin. Contradictory experiments made by *Mironesco, Schultz, Remlinger, Herman, H. Cohn, Kuss,* and *Lobstein, Basset, Arloing* and *Forgeot* have, on the contrary, demonstrated that physiological pulmonary anthracosis has its origin in the entrance of dust into the lungs alone, and that the permeability into the intestines is too slight to permit notable quantities of particles to pass.

A commission, appointed by the Society of Biology at the request of the experimentators, and composed of *Dastre, Henneguy, Letulle, Malassez* and

Borrel has declared, after satisfactory experiments, that the passage of particles of coal from the intestine to the mesenteric glands takes place only in cases of repeated and long ingestion and under conditions of permeability yet to be determined. The question of pulmonary anthracosis was reserved.

Under the microscope, the granules of hematic origin appear irregularly rounded or ovoid, and purple, red, or orange in tint. The particles of coal are generally irregular, angular and quite large. They appear under the magnifying glass completely opaque, which gives them a uniform black tint. Pulverized vegetable charcoal particles may show threads of vegetable cells not destroyed by the carbonization; it is thus that *Traube* has been able to recognize the existence of punctured cells of coniferous origin. The grains of *melanin* are smaller, and are well rounded, with a sepia hue and a little translucent center.

After from fifteen to thirty minutes of contact with concentrated sulphuric acid, the pigments of hematic origin, whether recently formed or not, dissolve and color the reactive or the anatomical tissue which contains them a red or a yellow hue. After several hours of contact, the coloration changes to a blue and then to a green. Melanotic granulations are very resistant to chemical agents, and even to sulphuric acid. To differentiate them with the aid of reactive agents, from soot particles,

it is well to resort to the action of boiling alkali (saturated solution of potash). The melanotic grains become yellowish and coherent without in reality dissolving, while the smoke black corpuscles treated in the same way do not change.

Emphysema. In the glands of calves' lungs, very much inflated after killing, one may sometimes notice that the aspect of a section of a gland is changed by interstitial gaseous infiltration. Instead of having a pale, rosy color and a shining reflection, the surface of the section shows in places a dull hue and a strong, rosy color analogous to that of the inflated lung. With a magnifying glass, one may detect that these spots of different color are infiltrated with very fine bubbles of air pressed near to each other. I have had the opportunity of seeing also the mammary lymph glands of cows presenting similar changes, after an artificial insufflation of the udder made during the treatment of parturient apoplexy. The gland then had a tint of dull yellow aspect. In these cases, the air had probably entered the organ through the lymphatic vessels.

CHAPTER XV

Parasitic Alterations

These include: 1. Those produced by vegetable parasites (*phyto-parasitic* or *mycosic*). 2. Those due to animal parasites (*zooparasitic* or *zoonosic*).

Vegetable Parasitisms or Mycoses

Endoparasitic fungi, after entering an organism, may localize on the surface of the digestive or respiratory mucous membranes or again invade the tissues and cause true generalized infections. They may then multiply as colonies in the various organs and develop into tubercules or abscesses. As examples of generalized infection, we have the epizootic lymphangitis or farcy of Africa and the farcy of cattle.

The pathogenic fungi which may infect the various tissues of the organism, and particularly the lymphatic glands, belong to several of the botanic groups of the cryptogams. It must, however, be remembered that the reproduction of these endoparasites does not take place in the middle of the tissues, and that their growth is reduced to that of

the mycelia by successive germinations. Never is fructification (conidia) observed, as the inoculated spores germinate but do not reproduce.

Oomycetes, Mucorineas. The virulence of spores of some of these organisms *(Mucor corymbifer, Regineri, Truchisi)* is explained by their power of growth under the temperature of the bodies of mammalia and birds. For their spores to be pathogenic for the higher animals, they must be of small size (between two and six W.), smaller than the hematids of the inoculated animal, miscible with water and having for maximum of growth 37 to 40 degrees C.

Glandular lesions due to mucormycosis have been observed only in animals inoculated in experiments, through the veins or in the peritoneum with a large quantity of spores.

Or. *Ascomycetes.* Fam. *Discomycetes.* Trib. *Exacaseas.* G. *Saccharomycetes.* Saccharomycetes which develop only in yeast (absence of sporulation, budding of the cells in conidia) have been designated under the name of *Blastomycetes* by Frank or of *Cryptococcus* by Vuillemain. They may infest glands in some diseases. Let us mention first the *Cryptococcus guttulatus,* found by Roncali in a lymph gland of the axilla, and the *C. Tokishigei* found in Japan by *Tokishije* in the glands of horses affected with a farcy analogous to that of Africa. The same author has seen also the same lesions in

cattle. The glands, friable, and infiltrated, showed disseminated purulent centers containing numerous cryptococci.

Rivolta discovered, in 1873, the *C. Farciminosus* in the lesions of the lymphatic glands of horses affected with epizootic lymphangitis (African or river farcy).

San Felice isolated the *C. Lithogenes* from the calcified center of lymph glands, taken from a steer, dead with primary carcinomatosis of the liver with lymphatic generalization of the infection. The parasite owes its name to the calcareous degeneration that it may undergo in the tissues.

Fam. *Carpoasceas* or *Perisporiaceas;* trib. *Perispories;* g. *Aspergillus.* The *Aspergillus fumigatus* is the only one truly pathogenous. Franck has found it in the coats of the small intestine and in the mesenteric glands of cows killed by butchers. The glands presented caseous or calcified miliary tubercles which sometimes were as large as peas; the lesions differing from those of tuberculosis by their greenish color. The pus contained threads of mycelia of *Aspergillus fumigatus,* as experiments by inoculation and cultures proved.

Histologically, the lesions of Aspergillosis recall, because of their structure, those of bacillary tuberculosis of Koch. In the center of the granulations are seen the threads of mycelia surrounded with epithelial cells, giant cells, and leucocytes.

Imperfecti fungi. Gr. *Hyphomycetes,* Sect. *Mucedinas.* Among these are found fungi which have lost the faculty of giving off reproducing organs and which vegetate only by division of the hyphæ of the mycelium. The segments which are thus formed soon become rounded to give *Oidies,* which little by little will break up like yeast cells.

Discomycetes. Rivolta, 1878. Syn. *Streptothrix,* Cohn, 1875; *Actinomycetes,* Harz, 1877; *Oospora,* Sanvagean and Radais, 1892. Fungi of this gender give rise to the diseases which are designated under the name of *Actinomycosis, Actinophytosis* or *Discomycosis.*

In cultures, these fungi are seen as threads of mycelia, ramified by dichotomy, with thick, aerial hyphæ which separate in oidies and by germination reproduce new mycelia. Later on, these mycelia divide into small pieces, resembling bacilli or even micrococci. These may grow in their turn and give birth to new fungi.

In their parasitic life, these same cryptogams change form and the extremities of their threads swell out like a club on account of the thickening of their membranes. These formations do not represent the organs of reproduction, but the sequelæ for the defence of the tissues against the invasion of the parasites.

Discomyces Bovis. These fungi appear in the middle of tissues as microscopic granulations, which

may reach the size of fine gravel. They are yellow in color, and get darker as they become old.

Examined under low power, these clubs are disposed in rounded tufts, capitella like. They present in the center, when examined sideways, a granular and shining aspect; while on the periphery they show a radiating disposition. All the clubs are inserted upon a fettered network of ramified threads of mycelia. They may assume irregular shape and become calcareous.

The mycelia color by Gram's and Weigert's staining methods, with the clubs taking better acid coloring matters, such as carbolized fuchsin (Ziehl), eosin, or purple acid.

Each actinomycotic granulation represents, in reality, a colony composed, first, of short, ramified and radiating filaments; then, later, a closed network of these filaments, which stretch and multiply and thread out of the periphery of the mass numerous radiating filaments. The last mentioned undergo, by degrees, the involutive transformation into clubs; while the filaments of the center of the colony subdivide to dissociate like little sticks, *batonnets,* and micrococci.

Other species of parasites have been noticed in the lesions of Actinomycosis, the principal being the *Discomyces Israeli* and the *Actinobacilli* of Lignieres and Spitz. Out of nineteen cases of actinomycosis of the jaws of cattle examined, *Pinoy*

has found thirteen cases due to *Discomyces Israeli*, three of *Actinobacilli*, two only of *Actinomyces Bovis*, and one case of the two Discomyces mixed.

Discomyces Israeli. It is differentiated from the D. Bovis because it is cultivated well in the absence of oxygen, and gives tetrahedronical grains upon cultures of gelatin; the *D. Bovis*, on the contrary, grows well in the air on glycerined potato, and when under culture takes a greenish lichenoid aspect.

Actinobacilli. These bacteria, scarcely larger than those of chicken cholera, appear in the organism always in radiated masses, but having the bacillary form in culture. They discolor rapidly when the methods of Gram and of Weigert are used. They also swell into clubs which may ramify in budding. The center of the tuft never shows filaments of mycelia, either simple or ramified.

The lymph glands, corresponding to the organ or to the tissues invaded by actinobacillosis, are generally altered, but the glandular infestation is exceptional in the lesions elsewhere, due to discomyses. All the glands of one region may be altered, which, however, the transportation of the bacilli by migrating cells explains. According to Lignieres, the glandular infection may also be primitive and even manifest itself without any other lesion.

The pus of the lesions of actinobacillosis is very sticky, adherent to the fingers, milky white or slight-

ly greenish, and when squeezed between two glass slides, it shows little grumes of a fine, grayish white consistency, as big as the head of a pin at the largest. Yellow grains are never found, as in the lesions of Discomycetes, nor are calcareous granulations.

In the case of a naturally developed, generalized actinobacillosis of sheep, Lignieres and Spitz have found lesions in the mediastinum, the mesenteric and the guttural lymph glands. Some were abscesses full of pus, as thick as putty and slightly greenish, while others had only little purulent foci in their periphery.

Stolpe has studied actinomycosis of the lymphatic glands in the salted tongues of American cattle, delivered at Hamburg, and Kowalewsky and Swiatoslowski have examined some in Russia. The results were as follows:

In the acute state, the glands were tumefied, more or less hemorrhagic with softening in the center. Old lesions were characterized by a whitish fibrous band circumscribing actinomycotic centers the size of a hemp seed, a pea, or exceptionally a bean. The centers have the spongy texture of a tissue softened by purulent infiltration, and are a grayish yellow. Pressure upon a section squeezes out small clots or whitish twists of pus.

Tuberculous glands never have these spongy foci, infiltrated with pus. The content of a tubercle is caseous, drier and more consistent; the envelope is

grayish white at the periphery and shows a yellowish gray coloration as it comes nearer the caseated parts. When old, the purulent foci may break up completely, the glandular tissue and the organ then becoming fluctuating. The retro-pharyngeal and sub-glossary glands are generally the most frequently affected. From the histological point of view, it is observed that at the beginning the fungi give rise to an inflammatory reaction of the tissues with increase of phagocytes surrounding the rising tufts of the fungi.

Leucocytes and conjunctive cells are transformed along with epithelioid, and some of these elements allow the mycelia to penetrate into them, while others surround the parasites in greater number to arrest their growth. The threads of mycelia then take the involution forms spoken of.

Discomyces Farcinicus. This parasite promotes in cattle a special affection, called *bovine farcy.* The fungus is found in the pus or in the tissues, in the form of small tufts of filaments formed of mycelia mixed together in an inextricable manner. It then forms an opaque nucleus from the periphery of which start a number of fine prolongations which give the whole a peculiar burdock aspect. These excentrical filaments are never transformed into clubs. This streptothrix takes the Gram stain and fixes basic colors.

The affection is characterized by adenitis and su-

perficial lymphangitis. The lymphatic glands contain creamy pus, and are sometimes filled with pseudo-tubercles the center of which is caseous or purulent. The pus contains a great quantity of bacillary brush-like masses.

Animal Parasitisms or Zooparasitic Alterations.

The animal parasites belong only to either the Protozoa, helminthes or arthropoda.

Protozoa. Cl. *Sporozoa;* Gr. *Coccidium* (Leuckart) or *Eimeria* (Rivolta). In a case of intestinal coccidiosis of the rabbit, Reincke has found in the mesenteric glands young growths of *Coccidia* (C. *perforans var. cuniculi).*

Proger and Zurn have found in the lesions of the intestines and of the mesenteric glands of a calf that had died, when between five or six weeks of age, from a severe attack of enteritis, coccidia *Eimeria Zurni* similar to those met with in the intestines of the rabbit.

Worms—Helminthes. The presence of echinococci in the glands has been observed. (Kowalesky.)

Cysticerci cellulosae are frequently seen in all the glands of swine when the muscles are much diseased from an invasion of the parasites. The invaded glands are generally those at the entrance of the chest and those of the sub-maxillary region.

There is no envelope of inflammatory tissue round the parasite, and, under the influence of the development of the cysticercus, the glandular tissue becomes atrophied, to be replaced by a small oval cavity lined with a thin translucent layer of dense connective tissue. Sometimes the cysticercus is found reduced in size, shrunken and entirely calcified, and it has then the aspect of a small, hard, whitish grain.

Trichinæ have also been found in the mesenteric glands.

Arthropods—Arachnoidae—Linguatulae. The denticulated linguatula, larva of the tœnioid linguatula of the nasal cavities of the dog (Leuckart) is very frequently found in the mesenteric lymph glands of sheep (G. Colin of Alfort), especially in the leanest animals of a flock and in those that are predisposed to cachexia. The affected glands assume first a brown color on the outside, and their consistency diminishes, and they even become friable. Upon section, one sees the glandular tissue destroyed and hollowed out with small cavities that are more or less anfractuous, and communicate and contain a soft brownish mass in the middle of which the linguatulæ are found. The cortical layer, when not affected, gets thinner, little by little, and may burst under the slightest pressure. The linguatulæ appear in the middle of the mass in the form of small, whitish worms, elliptical in shape, translucent and

flattened. They measure about five millimeters in length and three in width, with their heads much larger than the caudal extremity, and they have four hooks. The body is divided by eighty or ninety rings which have, posteriorly, a fringe of fine denticules. In some glands, where the parasites have escaped, openings are left with irregular edges, which are obstructed by greenish plastic deposits. Later the gland gets indurated and has caseated deposits in its substance. The mesenteric lymph glands are generally the only ones affected by the parasites, and those of the sub-lumbar regions, of the arm-pit, and of the entrance of the chest, remain intact.

It is especially during the season which extends from the beginning of April to the middle of June that Cohn has observed those alterations in sheep from Berry and Sologna. Babes has frequently found denticulated linguatulæ in the mesenteric glands of the cattle of Roumania. After staying in these organs for a time, the parasites leave, as traces of their passage, little pisiform tubercles, filled with a greenish, calcified magma, easily enucleated from the enveloping fibrous capsules.

CHAPTER XVI

Microbian Alterations

Normal Microbian Flora of Lymphatic Glands. The presence of bacteria in lymphatic glands, in the normal state, has been the object of many controversies. Wissokowitch, Neisser and Labbe have found them without micro-organisms, while Loomis, Pizzini and Kossel have shown, by the inoculation of the glandular pulp, that the infection existed in some of the glands. Perey has studied the bacteriology of glands of various regions and, as saprophytic microbes, he has found: *Sarcina aureus, Fuscus mesentericus; Ruber M. Bacterium Zopfy, Micrococcus flavus liquefaciens,* and as pathogenous agents: *stophylococci, sarcina* and *typhiform microbes.* These microbes often remain in the glands in their spore states. Desoubry and Porcher have demonstrated the existence of microbes in the thoracic duct. Chretien has examined mesenteric, prescapular and retropharyngeal lymph glands, secured immediately after death from animals killed by the butcher, before being fed, and he has found streptococci and staphylococci. The glands of other regions exhibited none.

Other researches made on this subject, with material taken from well, rested animals, and which were found free from any visceral lesions not consistent with health, would prove very interesting. Any investigations made under the various physiological conditions might also be carried out for anaerobic microbes.

Bacterium of Anthrax. G. Colin has demonstrated that by anthrax inoculation the glands of the invaded lymphatics were successively transformed into virulent centers. In species having great receptivity, these steps of infection do not exist and the microbian invasion takes place immediately. Pasteur and Toussaint, having noticed in sheep that glandular alterations were more often to be found in the guttural region, have thought that inoculation almost always took place through the bucco-pharyngeal mucous membrane, caused by pricks of the spikelets of gramineous or of other plants taken in with their food. On the contrary, Koch claims that the entrance of the bacteria takes place through either the closed follicles or Peyer's patches.

After infection, the glands of the tissues which are first attacked are hypertrophied, red, softened, friable, and of a dark red color with hemorrhagic spots, and surrounded by abundant œdema. Under microscopic examination, it may be noticed that the glands situated nearest to the point of inoculation contain an enormous number of bacteria, which

multiply around the follicles. In the glands of the other regions, the network of capillaries only is infected.

Rouget. The glands of the various regions of the body appear turgid and hypertrophied, with the cortical zone and the interfollicular septa highly congested. This congestion invades even the lymphoid follicles, which have a purplish color and abundant serosity impregnates the whole organ. The specific bacilli multiply in greater quantity in the glands than in the blood. Under the microscope, after coloration with Gram stain, they are frequently seen inclosed in the leucocytes, and, upon section, the capillary emboli may be seen, due to masses of packed cells.

Hemorrhagic Septicemia. In the acute forms, the lymph glands are hypertrophied and hemorrhagic; in the chronic, they are increased in size and infiltrated. The Pasteurella is found in the acute forms by bacteriological examination of the glandular mass, immediately after the death of the animal.

In swine, the Pest (Swine Pest of Preisz, Salmonellose of Lignieres, Hog-Cholera of America, Schweinepest of Germany) and the pasteurellic Septicemia (Pasteurellose of Lignieres, Schweinesenche of Loeffler, American Swine Plague) are two different diseases.

In the first, the lesions of the intestines assume an ulcerative and necrotic character, and are covered

with diphtheroid exudates, and at the same time the mesenteric and bronchial glands become caseated. Bang says that this change in the aspect of the lesions is due to the necrotic action of the necrosis bacillus which lives as a saprophyte in the digestive canal and becomes pathogenic when other specific alterations already pre-exist on the intestinal mucosa.

In the caseous glands, ovoid bacteria are found associated with fine bacilli.

In affections due to the Pasteurella, the glands never become caseous, they only remain hard and hypertrophied.

Preisz and Lignieres have found in the lesions of Pest a bacillus which they thought specific and that they proposed to call *Bacillus suipestifer* and *Salmonella.*

In 1904, de Schweinitz, Dorset, Bolton and McBryde made a study of American Hog Cholera, and observed that the blood filtered through porcelain remained virulent, and they concluded that the infection of the diseased animals was due to a filterable virus. A similar observation, which has to be controlled *de novo,* has also been made by Hutyra for Swine Septicemia.

Pyogenic Microbes. In all suppurations, and specially in purulent adenitis, the *staphylococcus pyogenes aureus,* the s. p. *albus,* and the s. p. *citreus,* may be discovered and recognized by the coloration

on gelatin media. *Streptococci* may also be found in the pus. The *S. equi* of Schultz, which is the infectious agent of horse distemper, may be found in great numbers in the abscesses of the glands of various regions.

Glanders. This disease is due to the bacillus mallei, a fine bacillus, discovered in 1882 both by Bouchard, Capitan and Charrin in France, and by Loeffler and Schultz in Germany. It offers, among other lesions, adenitic, which vary in their characters according to whether the affection is in an acute or chronic stage.

In the acute disease, the glands are hypertrophied and hollowed with centers of oily saffron pus. The most altered glands are those of the groin, the maxillary space, the mediastinum, and the bronchi. The glandular tissue is completely destroyed, and there remain only the follicular divisions. In the purulent or caseous contents are found cellular broken-down remains of all kinds with granular nuclei, among which the bacilli may be discovered.

In the chronic form of the disease, the glandular tissue, first hypertrophied and infiltrated, shows, later, caseous lesions, surrounded by a fibrous capsule and containing giant and epithelioid cells as well as bacilli. Gradually the parts which are not caseated are invaded by sclerosis.

Symptomatic Anthrax. The glands of those regions recently diseased are voluminous. Their sec-

tion shows their medullary portion to be hyperæmic and the lymphoid part to be of a dirty yellowish white, and a fresh section of the organ has a marked odor of strong butter. When the symptomatic anthrax tumor is very large, the softened gland has numerous hemorrhagic foci, and is infiltrated with a yellowish serous fluid. With the microscope, the presence of the *Bacterium Chauvoei* may be detected in its various forms, according to the state of the sporulation of the bacillus.

Gangrenous Septicemia. The glands are infiltrated with a rosy, muddy serous fluid, and the pulp has a dull reddish tint with numerous hemorrhagic spots. The bacteriologic examination reveals the presence of the septic vibrio with its bacillary form.

Tuberculosis. This disease gives rise, in the lymphatic glands, either to caseous adenitis or to hypertrophies which closely resemble lymphadenosis and to which Berger and Bezancon have given the name of *tuberculous lymphoma.*

In natural or experimental conditions of glandular infection with the bacillus of Koch, the microscopic lesions do not always appear immediately. Indeed, there exists *occult* glandular tuberculosis, disclosed with difficulty by histological investigation, and only revealed by the inoculation of guinea pigs. Occult lesions were first mentioned by Orth, then by Arloing, Lignieres, Barthel, and lastly by Vallee, who has well demonstrated the tolerance of

the glandular tissue for the tubercle bacillus. It is their belief that the clinical manifestation of latent, bacillary infection by the formation of tubercles may be rendered slower by a local or general experimental state of immunization or natural state of immunization. Joest, Noack and Liebrecht have observed that out of fifty-seven glands, apparently healthy, taken from thirty-eight bovines with generalized tuberculosis, eighteen proved virulent. Most of the authors who have occupied themselves with the subject of occult tuberculosis agree in the conclusion that there cannot be bacillization of the glands without concomitant histological lesions. These pass unobserved only when they are isolated, very much localized and small. Hence the necessity for making a great number of histological sections is manifested. Vallee considers as suspicious in a tuberculous animal all glands that are softened, slightly hypertrophied, hemorrhagic, or those whose cortical and medullary layers on the surface of a section have a granular aspect and a uniform rosy gray tint, resembling that of the cortical layer of the brain. With a magnifying glass, whitish gray granulations, which cannot be seen with the naked eye, are sometimes observed. By exposing a section of the suspected gland to the action of salt, or by freezing it, the parts that are undergoing tuberculization are made more prominent.

Vallee has proven that the penetration of the tu-

bercle bacillus near the intestines could take place without giving rise to any apparent lesions of the lymphatic glands.

Calmette and Guerin have remarked that the evolution of the lesions following intestinal infection differs according to whether it takes place in young or adult animals. In the young, the follicles and the follicular bands leave no empty spaces in the intervals of the blood-vessels as they are filled with lymphatic cells, and on the contrary, in the adult, the follicules are separated by empty spaces. It seems, then, that the young gland is a true filter for the microbes, while the adult lets the bacilli and leucocytes pass toward the hilus and the efferent canals. Also it has been found that pulmonary tuberculosis contracted by natural intestinal infection will leave no trace in the mesenteric glands.

Glandular Lesions. In the beginning of the infection, the glandular lesions consist of very fine granulations, the size of a millet or hemp seed, of a pearl gray tint, and translucent (gray granulation of Laennec). This is sometimes surrounded with a light reddish congestive ring. Gradually the center undergoes caseous degeneration, and it becomes opaque and yellow, with a dense periphery, and this is the true tubercle. At the onset of the glandular infection, the development of the tubercles generally takes place at the level of the lymphoid follicles, while in other cases the process increases gradually,

the lesion has a nodular aspect, and a diameter of from five to ten millimeters, and may even reach the size of a nut. The centers of the nodules become entirely caseated and present irregular cheesy masses with tracts of necrosis more or less anastomosed, somewhat hard, and rough to the touch. These nodules may become confluent and their centers either dry or, at best, become more or less shrunken, or perhaps transformed by softening into a putty-like or semi-fluid magma. In the cheesy mass may be found calcareous grains, detected by crushing the pulp between the fingers. By this union of the nodular lesions, the gland may in time be entirely occupied by tubercular deposit. The organ may be hypertrophied by the infiltration of its tissue, the proliferation of the lymphoid elements outside of the diseased parts, and by the effects of the gradual caseation of the tubercles.

Muscular glands, according to Stroh, are rarely invaded in adult bovines, but often in calves. In the adult, also, the prepectoral and popliteal glands are the most infected, and in calves the prepectoral muscle. The superficial inguinal muscles of cows and sows are often diseased.

In the slaughter houses of Paris, in 1908, the statistics of the glandular lesions of 3,810 tuberculous animals run as follows:

Hepatic Gl., 1230; Mesenteric, 926; Mediastinal, 1508; Bronchial, 3158; Retropharyngeal, 591;

Sub-Glossal, 254; Prescapular, 132; Axillary, 26; Sus-Sternal, 607; Intercostal, 134; Renal, 101; Sub-Lumbar, 238; Iliac, 244; Precrural, 54; Inguinal, 96; Ischiatic, 83; Popliteal, 31.

In swine, the following percentage has been established: Hepatic, 58; Mesenteric, 60; Bronchial, 85; Sub-Glossal, 68; Pre-Parotid, 42; Retroparotid Superior 62, and Inferior 56; Prescapular, 44; Axillary, 60; Sus-Sternal, 56; Dorso-Aortic, 64; Sub-Lumbar, 40; Iliac, 40; Ischiatic, 8; Inguinal, 20; Precrural, 8; Popliteal, 4.

Chronic Hypertrophic Enteritis of Bovines. In 1903, Markus called attention to that disease in which the intestinal mucosa and the mesenteric lymph glands are invaded by epithelioid and giant cells with enormous masses of acido-resisting bacilli. Macroscopically the glands were only tumefied and filled with juice. Section of a gland colored by Ziehl-Nielson's method showed that the bacilli resembled those of Koch, but were shorter, a little thicker, and colored well with Gram stain, the blue of Kuhne and of Giemsa.

Caseous Adenitis. In sheep, infection with the Preisz-Nocard bacillus gives rise to lesions not only visceral but also glandular. The alterations consist of purulent centers generally involving the whole gland. In the center of the organ, which has become voluminous, there is a slightly greenish, thick and creamy pus at the beginning of the disease, which

later becomes hard and caseous. The gland is surrounded by a fibrous whitish capsule.

The lesions due to the Preisz-Nocard bacillus also observed in swine, present themselves under the form of sub-cutaneous or intra-muscular abscesses with frequent purulent adenitis. The cervical and prepectoral glands are those most commonly diseased. These abscesses, like those of sheep, have a fibrous capsule, containing a creamy or pale green pus.

Alterations due to Putrefaction

In the study of the alterations observed in meat undergoing putrefaction, the examination of the lymphatic glands is not without its use. Before having the apple green color characteristic of the fat as well as the lean putrefied meat, the fatty surfaces of the regions which begin to feel the effects of the degeneration present first a pale greenish hue which has little in common with that of meat which has been aged under modern artificial refrigerator methods. Examination of the glands allows one at the very beginning to recognize the invasion. The organs are undergoing unmistakable changes, they become soft and are soon changed into a kind of mush: the rosy white tint of a section is changed to that of a dark, brown, slate hue, which begins in the medullary part. At the same time, a fresh sec-

tion emits the garlic odor so peculiar to putrefaction. Under these circumstances the pre-scapular and inguinal glands should be especially examined.

FINIS

SYNOPTICAL INDEX